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ABSTRACT

This document consists of a joint lecture/discussion co-delivered as the 1987 University Senior Research Scientist Lecture at the University of Michigan's Institute for Social Research. The opening remarks by Jerald G. Bachman describe how the program of research into drug use among youth and young adults evolved at the Institute for Social Research, and how the program developed its annual surveys of lifestyles and values of youth. Thereafter, Lloyd D. Johnston describes current research designs and procedures for the Monitoring the Future project, an annual survey of a representative sample of high school seniors, together with follow-up surveys of a subset of these students up to age 22 noting that the survey covers a wide range of topics and has taken place every year since 1975. He then presents a selection of findings relating to changes in the use of four specific drugs: marijuana, cocaine, cigarettes, and alcohol. Bachman follows with a discussion of patterns of change and stability in post-high school drug use. In particular, he discusses how changes in drug use relate to the new roles and responsibilities of young people after they leave high school. The final part of his talk focuses on how changes in marijuana use are linked to changing perceptions among young people of the risk involved in using it. The presentation includes 30 visual displays, some showing statistical data and trend analysis graphs. (TE)

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DRUG USE IN AMERICA: DIFFERENT KINDS OF CHANGE, DIFFERENT CAUSES

The 1987 University Senior Research Scientist Lecture

The University of Michigan

Jerald G. Bachman and Lloyd D. Johnston*

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Jerald G. Bachman, presentor

OPENING REMARKS

Our primary theme today has to do with drug use among youth and young adults, and how that has been changing in recent years. But a subtheme, which seems especially appropriate for this occasion, involves aspects of research design, strategy, and management.

With that subtheme in mind, I want to begin by saying a few words about how our program of research evolved at the Institute for Social Research, and how we came eventually to be doing annual surveys of the lifestyles and values of youth. Following this brief introduction, Lloyd will say more about our current research design and procedures. After that, we will each present some key findings which have emerged from our studies of drug use and the ways in which drug use has been changing.

Benefits from being in ISR, and Acknowledgments

The first thing I want to say about the evolution of our research program is that we have benefited in many ways from our membership in the Institute for Social Research.

One obvious benefit is our access to high quality technical sections for conducting sampling, interviewing, questionnaire administration, coding, and data management. These sections are by no means limited to carrying out the actual steps of survey research; they also offer advice on both technical and substantive matters, and such advice has contributed importantly to our research.

Another benefit is our contact with colleagues in ISR who are involved in carrying out their own research. An important Institute norm is that researchers take time to share advice and ideas with each other. Such sharing occurs widely, and it often extends across a variety of disciplinary boundaries and substantive interests.

These and other aspects of the organizational climate made it possible for me, as a very junior member of the Institute back in 1965, to collaborate with a well-known senior colleague, Bob Kahn, in designing a nationwide study of the causes and consequences of dropping out of high school. That study became the Youth in Transition project, and it launched a program of research on youth and social issues which now has been going on for more than two decades. This is a nice opportunity for us to thank Bob Kahn for the key role he played in getting all of this started.

Our very special thanks are due also to Patrick O'Malley, who has collaborated with us extensively in both the Youth in Transition project and our current Monitoring the Future project. Patrick has been a partner in developing all of the findings on drugs which we will report today, so we take this occasion to thank him and to acknowledge that in many ways this award recognizes his work as well as Lloyd's and mine.

One final word of acknowledgment: We have been exceedingly fortunate over the years in having the services of many talented and dedicated staff members. They have contributed greatly to the quality of our research, and also to the quality of our lives.

Lessons from Youth in Transition which helped Shape Monitoring the Future

Now I want to say just a few words about how our program of research evolved from the earlier Youth in Transition project to the current Monitoring the Future project. I suppose this story could be called: "From Dropouts to Drugs."

As I mentioned a moment ago, the primary purpose of the Youth in Transition project was to learn more about the causes and consequences of dropping out of high school. Our research strategy was to start with a nationwide sample of tenth-graders, and then follow them for several years until some had dropped out of high school and most had graduated. Our plan initially called for a three-year longitudinal span, but additional interests and opportunities led us to expand it to four years and then eventually to eight. We did learn a good deal about dropping out of high school, about educational attainment in general, and about a number of other topics which were not part of our original research plan. In addition, we learned some important practical lessons about both the advantages and the limitations of the kind of longitudinal research we had been doing.

One important lesson we learned is that there is a broad need for basic information about youth -- information based on nationally representative samples. We found that not only social scientists, but also educators, journalists, and policy-makers all want to know about what the nation's young people are thinking and doing and planning for their futures.

Another lesson we learned is that research interests, and public policy concerns, shift over time; thus, especially when engaged in a long-term project, there are advantages in having a considerable breadth of measurement coverage. There are also advantages in having enough flexibility to be able to add new measures and topics, as we did several times in the Youth in Transition follow-up surveys. One of our most important additions, as it turned out, was a set of questions dealing with the emerging problem of drug use.

Some other measurement areas in Youth in Transition also turned out to capture important changes which were taking place. For example, we recorded substantial rises in concern about the war in Vietnam, as well as large declines in trust in government.

The examples I just mentioned serve to illustrate a third lesson: Fundamental problems of interpretation arise when one finds changes in a single-cohort longitudinal study. Findings from Youth in Transition, taken in isolation, might have suggested that from age 15 to age 23 -- that is, from late adolescence to early adulthood -- young people tend to become more disillusioned or cynical about government. Certainly this cohort showed a sharp decline in our measures of trust in government. But that decline in trust occurred during the period from 1966 through 1974, and other surveys sampling adult cross-sections showed an equally large decline in government trust during that period. In other words, the trend we saw was much more appropriately interpreted in terms of societal factors and current history, rather than in terms of maturation from adolescence into adulthood. But in the absence of the other survey data, our longitudinal study following a single cohort could not have distinguished between these two interpretations.

The moral of this story is that it is unwise to make broad generalizations from a single cohort followed through time. And the conclusion we drew for our own program of research was that if we wanted to continue our focus on youth and social issues during a time of social change and ferment, we needed to build upon the strengths of the Youth in Transition study while at the same time avoiding its limitations. In particular, we wanted to avoid being limited to a single cohort.

Accordingly, when we designed a new research project called Monitoring the Future, our plan called for sampling each new class of high school seniors, and then tracking them across time. In

effect, each graduating class would be the starting point for another panel study. Our initial data collections would reflect the cumulative effects of home and school on lifestyles and values, and the follow-ups would tell us much about the changes which occur during the various transitions to full adult roles and responsibilities. The study was designed to serve two different, but complementary, research purposes: it would support explanatory analyses examining the relationships among a number of variables measured across time, but it would also be a social indicator study tracking various kinds of changes in the lifestyles and values of youth. In other words, we wanted both an accurate description of WHAT was going on, and also the ability to analyze WHY it was going on.

As you can well imagine, it is much easier to design such an ambitious project than to get it funded. Although our first plans were drawn up in 1969, it was not until 1974 that we found a sponsor. But Lloyd is going to tell that part of the story, so let me turn the lectern over to him.

Lloyd D. Johnston, presentor

INTRODUCTION:

As Jerry has indicated, the lessons learned from Youth in Transition helped shape our new proposal for Monitoring the Future -- a project which would not rely on a single cohort, and which had as *one* of its explicit purposes the generation of social indicators on important phenomena among youth.

The content was intended to be broad, focusing on domains in which individual attitudes and behaviors are particularly important both as causes of social problems, as well as to the solution of them. The study thus would encompass such areas as race relations, sex-role attitudes, delinquency, attitudes toward work and education, and so on.

Drug use grew as a central focus, as it became clear that finding a funding source for such a comprehensive study would be quite difficult, and as our ability to raise funds in the drug field grew as a result of work done on this subject in the Youth in Transition study.

The country's drug problem, of course, was growing by leaps and bounds at that time. It was spreading from the nation's campuses -- where it largely originated in the late 60's -- to other groups the same age; but it was also spreading down the age spectrum to secondary schools. There existed rather little national data on drug use, especially data useful for monitoring the changing nature of the problems; and our new Monitoring the Future design offered a cost efficient method for doing just that in the two segments of the population most "at risk" -- adolescents and young adults. Finally, the fact that widespread use of illicit drugs was a fairly new phenomenon meant that little was known about what would be the natural life course of these behaviors in the "normal" population. Obviously panel data like those we proposed to gather would be particularly useful for answering such questions.

So, in 1974 the White House Special Action Office on Drug Abuse Prevention, and the newly formed National Institute on Drug Abuse, agreed to launch this research project, and the latter agency has provided continued support since.

RESEARCH DESIGN

Let me tell you a little about the nature of the design before sharing some of our findings from Monitoring the Future with you. Each year since 1975 we have conducted a nationwide survey

of a representative sample of high school seniors, using self administered questionnaires given in the normal classroom setting. These are large samples -- of about 17,000 seniors per year -- located in roughly 135 public and private high schools in the coterminous United States. Because the samples are so large, we are able to use five different questionnaire forms, and thus cover an unusually wide range of subjects. However, some questions, including the key drug use measures to be discussed today, are contained in all five questionnaire forms.

After being surveyed as seniors, a representative subsample of each class is selected to comprise a panel for longitudinal study. Thus, each graduating class cohort gives rise to a new panel, which will be followed through the mail for some 15 years or more. After leaving high school, this panel of 2,400 seniors from a given class is randomly divided into two half-samples of 1,200. Both halves receive a follow-up questionnaire on an every-other-year basis, the difference being that one receives theirs on odd-numbered years, while the other receives theirs on even-numbered years. The end result is that every class is represented in every year's follow-up survey; but individual respondents can be given a two-year "rest" after each survey, before being resurveyed. Respondents are paid five dollars, with a check attached to the front of the questionnaire; and each year they also receive a newsletter.

Response rates are surprisingly high -- particularly for a mailed survey -- ranging from about 85% of the original panel, on the first year of follow-up, down to about 70% by the eleventh year, which is as far out as we have gone so far.

All of these surveys omit the dropouts from high school, of course, which we know from census data to be a fairly constant proportion (about 15-20%) of all classes since the early 70's. However, because virtually all college students are drawn from high school graduates, each follow-up survey since 1980 has contained an excellent national sample of about 1100 college students. Thus we can characterize substance use trends in this important segment of the population, as well.

(Figure 1) This figure gives an overview of this multiple panel design which, incidentally, is often called a cohort-sequential design. Each row represents a graduating class. The column headings show the years in which data have been collected from them, and the cell entries show the average age of the respondents from each class for each data collection. The figure shows that we start collecting data from each class beginning when they are at a modal age of eighteen, which corresponds to senior year. Thus in 1987 (the right hand column) we surveyed 17,000 high school seniors and approximately 1,000 graduates from each of the previous eleven graduating classes, ranging in age from 19 to 29.

Two features of the cohort-sequential design are worth particular mention. The most obvious is that it involves the collection of panel data on individuals over time, which permits us both to characterize the life course of certain behaviors and attitudes, as well as to examine whether other changes in the person, his social environments, or his role in those environments, might help to explain any such changes over the life course. And conversely, we can look at possible outcomes which may *result* from substance use or other behaviors.

The more rare feature of the cohort-sequential design, however, is that it allows us to begin to differentiate three quite different types of change in the dependent variables (or any variables, for that matter):

1. Secular changes -- that is, those occurring simultaneously across a wide age band, or among all ages, in the population;

2. Age related changes -- that is those occurring fairly consistently at a given age or developmental stage, and which are observable across different birth cohorts; and

3. Cohort-specific differences -- that is, ways in which certain cohorts are consistently different from other proximal cohorts across much or all of their lives.

Jerry has already illustrated one reason that it is important to be able to distinguish among these types of change -- namely that inaccurate conclusions can be reached about the nature of what is occurring, and thus inaccurate predictions made on the basis of them. But of comparable importance is that the search for casual factors might be sent off in an entirely wrong direction.

RESULTS

We have selected four of the 30 classes and sub-classes of drugs we study, to illustrate both the three types of change *and* the ways in which data from a single cohort (or a single age-group) could have led us to a wrong conclusion. The four drugs we have chosen are certainly among the most important: they are alcohol, cigarettes, marijuana, and cocaine.

They differ considerably, of course, in the degree to which they have been culturally integrated. Alcohol has a long history of widespread use and is deeply ingrained in the culture. The use of cigarettes reached substantial segments of the population during the first two thirds of this century. Marijuana, by contrast, is more of a newcomer to the general population, having achieved popular status beginning in the late 1960's; and the popularity of cocaine did not burgeon until the late 1970's.

Marijuana

(Figure 2) If we look at the life course of marijuana in a single cohort fairly early in the drug epidemic -- we take here the class of 1976 followed over some years -- we might readily conclude (as some of our colleagues did) that there is an "age-effect," involving an increase in use between ages 18 and 21 -- an increase which might have been predicted to show up in future cohorts. Further, we might have begun looking for the causes of it among the types of variables likely to explain age effects -- that is, among changing biological or psychological conditions of the individual, or among transitions in social environments which occur routinely at that life stage.

(Figure 3) However, if we take a later cohort and follow them over the same developmental period, quite a different apparent age effect emerges. Now we see marijuana use declining from age 18 to 21, rather than increasing.

(Figure 4) If we place the data from all of the cohorts together, however, the answer to our riddle becomes clear. There was, in fact, a powerful secular trend occurring in the interval 1975-1986, with a sharp rise in marijuana use occurring across all of these age groups (or cohorts), followed by a sharp decline.

(Figure 5) If we look at data relevant to earlier ages, we get basically the same finding. Here, we have created estimated lifetime prevalence rates for lower grade levels by using the retrospective data provided by seniors, in which they tell us at what grade level they first tried marijuana. Again, you can see that for all age groups there was a peak around 1979 in marijuana use -- this time as measured by lifetime prevalence -- and a decline thereafter. This illustrates that we can use both retrospective, as well as prospective, data to get measurements on multiple cohorts at multiple time points. There are more limitations to the retrospective data -- they cannot, for instance, be used to measure attitudes or other psychological states or constructs -- but for memorable, objective phenomena like the first use of a drug, they can have some real value.

To return to the marijuana story, the fact that a secular trend occurred at a particular time in history implies that we should be looking at quite different classes of possible explanators -- specifically, at other historical factors which may be changing contemporaneously. These could include major historical events, such as war or recession; changes in laws or policies, or the enforcement thereof; new knowledge or awareness of consequences; changed norms, etc.

We were aware that there was a move in many states to decriminalize marijuana use in the late 1970's, but that could hardly explain the subsequent *decrease* in use observed. In fact, from a satellite study we conducted to look specifically at the effects of such laws, we deduced that they appeared to have virtually no effects on either attitudes or behaviors.

But one of the variables which we hypothesized from the outset might help to explain changes in marijuana and other drug use is perceived risk, and it has shown quite convincing evidence of being an important factor. The dangers or risks perceived to be associated with a drug correlate very nicely with the extent to which drugs are used. For example, of the illicit drugs, heroin is perceived to be the most dangerous and is the least used, whereas marijuana is perceived as least dangerous and is the most used. That we knew from our first survey in 1975. But coincident with the decline in marijuana use, which began after 1978, was a dramatic increase in the proportion of seniors who saw great risk associated with use -- particularly regular use.

(Figure 6) In fact, the proportion believing there is a great risk in regular marijuana use doubled between 1978 and 1986, -- a period over which actual daily use dropped by nearly two-thirds (from 11% to 4%).

Not willing to take either the cross sectional correlation, or the cross-time correlation, as sufficient proof of causation, we presented at a 1984 NIDA-sponsored conference on prevention evidence that, of those who quit marijuana use or who abstained from use, an increasing proportion since 1978 were mentioning concern about physical health and psychological health as their reasons for not using. Further, these two reasons were the most often mentioned by quitters and abstainers among a larger set of possible reasons for non-use.

The notion of such rational decision making contributing to drug-using behaviors did not sit well with many of our colleagues, especially in the prevention field, largely because they had evidence that the "scare tactics" of the early 70's did *not* work. It is now our belief that what they did was to throw the baby out with the bath water (and admittedly there was a lot of bath water. i.e. propaganda, in the early 70's). Our position is that credible messages from credible sources do influence beliefs, which in turn influence behaviors and, very likely, social norms along the way.

Nevertheless, the challenge was put to us at the NIDA conference, by our colleague Richard Jessor of Colorado, that perhaps other more general social changes -- such as an increasing level of conventionality -- were influencing both attitudes and behavior in regards to marijuana. Jerry will come back in a few minutes with some recent results of our testing that alternate hypothesis. First, however, let me continue with our main theme of how cohort-sequential design can help prevent serious misinterpretations of observed change.

Cocaine

The second drug I will discuss is cocaine. There seems to be little question that cocaine is the illicit drug of greatest public health concern at the moment, if you leave aside the derivative issue of AIDS transmission related to heroin use. Cocaine is now known to be dependence producing and capable of life-threatening overdose -- qualities it was alleged *not* to have as recently as the late 1970's.

(Figure 7) Recall that an early cohort in the drug epidemic showed a rise in marijuana use in the years after high school -- but that this turned out not to be an age-effect because it did not replicate in future cohorts. Well, cocaine likewise showed a very sharp rise with age in the class of 1976 cohort.

(Figure 8) This time, however, the age-related rise *does* replicate on future cohorts -- so for this period of history at least, there is a consistent age effect for cocaine use. However, if we look at the starting points for all of these cohorts in senior year, we can see that there is also something else going on -- in this case a secular trend, which involves a rise in use between 1976 and 1979 among all age groups. Thus, the Class of 1976 taken alone would have accurately suggested an age effect, *but* it would have given us an exaggerated picture of its size, since the panel data from that one cohort also reflect the impact of a more general secular trend.

Since we know there is a consistent age effect for cocaine, we can now look for explanators which might be related to age, such as an increase in discretionary income after graduation, greater availability of the drug in adult settings, a greater degree of role modeling or peer pressure in those settings, etc. These are obviously different factors than we would pursue in trying to explain a secular trend.

Incidentally, this rise in use after high school is even sharper among college students than it is among those not attending college. College students have levels of cocaine use virtually identical to their age peers, whereas in high school the college-bound had considerably lower rates of use. Obviously there is some "catching up" which occurs in college, and Jerry is going to have more to say about that in a minute, also.

The secular trend part of the increase in cocaine use -- that is, the rise in all age groups which took place in the late 70's -- required the examination of quite different types of explanatory variables. Two facts which we know from our surveys are: that the availability of cocaine rose during that period, and that the risks perceived to be associated with cocaine use actually declined. Those with good memories will recall that during that period a number of respected scientists were extolling the virtues of cocaine as a "clean, safe, non-addictive" drug. It was also a drug which was spreading downward from the elite, in the entertainment and sports worlds; which also may have contributed to its growing popularity. Surely, its increased availability and greatly reduced price have contributed to the fact that cocaine has remained at peak levels since 1980, despite cumulating evidence of its dangers. In fact, this leveling in the prevalence of cocaine hides the fact that, as we have reported elsewhere, since 1983 there has been a rise in the proportion of seniors reporting smoking cocaine, using it daily, and trying unsuccessfully to stop using.

Cigarettes

The third class of abusable substance we want to discuss is cigarettes -- the major psychoactive ingredient of which is nicotine, of course. If we track cigarette smoking for a single cohort -- again taking the Class of 1976 -- we get still a different profile across the age band than we saw for either marijuana or cocaine.

(Figure 9) Based on this single cohort we might conclude that there is a bilinear age effect in half-pack-a-day smoking with a sharp rise in the one or two years immediately after high school and a quite level rate of use thereafter.

(Figure 10) This time the data from multiple cohorts *do* bear out that generalization, which we might have made from only a single cohort. The same bilinear progression with age is observed with every cohort studied.

I should note as an interesting aside, that an examination of comparable data on smoking *at all* in the past 30-days does not show this same sharp increase in the first year or two after high school, which means that we are not observing an increase in the number of smokers right after high school, but rather an increase in the amount that they smoke. One obvious hypothesis for this abrupt age-effect is that departing the parental home after high school leaves youngsters less socially constrained in their smoking; but it turns out that we find the same increase in the rate of smoking among those who did not leave the parental home as among those who did. For the moment, our most viable explanation is that, after high school, smokers are less constrained from smoking during the day than they were in the school setting.

Going back to the figure on half-pack-a-day smoking, we see that something other than an age effect is going on, since the different graduating classes have different starting points in senior year. What we have here, for the first time, is a classic example of a cohort effect, in which (as it happens) the earliest classes remain at the highest smoking levels across time and the later classes at lower smoking levels, even controlling for age. This is something we could not have discovered with a single cohort, because we would have had no way of knowing that other cohorts had different levels of cigarette smoking at the same age.

(Figure 11) Nor could we have told it from repeated cross-sectional surveys of a given age group -- say, high school seniors -- since the changing levels of use observed could be explainable as either secular trends *or* cohort differences.

(Figure 12) Only using data from multiple cohorts is it possible to show a cohort effect. In this figure we connect the lines a different way: instead of tracing lines across time for each cohort, we now connect the lines across time for each age group (i.e., cutting across cohorts). What can be seen is that each age group displays peak smoking levels in a different year than the other age groups -- the peak years do not coincide, as was the case for marijuana, for instance (in Figure 5). This is because each age bracket reaches its peak level when the heaviest using cohorts pass through it.

(Figure 13) Looking at lifetime prevalence of daily smoking in the lower age groups (using the retrospective data gathered from the various senior classes), we find a similar story, in that the peak levels are reached at different years for different age groups. In fact, the heaviest smoking class cohorts were already identifiable by eight-grade, or perhaps even earlier.

In our search for explanatory variables, the importance of discovering a cohort effect of this sort is twofold. First, it suggests that whatever historical developments were responsible for the appreciable downtrend in cigarette smoking, which we observed among seniors in 1977 through 1981, probably were occurring in the early to mid-70's when those seniors were much younger, not in the late 70's when we happened to survey them. Thus the period in history in which we search for explanatory factors must be shifted.

In this case, it opens a very interesting possibility, since it was in 1971 that the advertising of cigarettes on radio and television was banned totally by the Congress. If you assume that advertising has a gradual, cumulative impact on the behavior of young people, then you would not expect to see an immediate effect on initiation rates, but rather one lagged by a couple of years, as appears to have happened among seventh and eight graders. (Of course, a change in advertising is not the only thing which was going on then. Beliefs about the risks of smoking were undoubtedly changing as well during the period -- partly as a result of the cumulating scientific evidence being well-publicized by the Surgeon General's Reports.)

Finding a cohort effect also suggests that some mechanism causes a consistency over time in the likelihood of engaging in the behavior. In the case of cigarette smoking, the first place we thought to look was at the addictive properties of the drug. Sure enough, we found that among

regular smokers in senior year, half already had tried to quit smoking and found themselves unable to do so. Half would still like to quit; and very few believe they will be smoking five years hence, even though we know from following them that the vast majority will still be smoking at that time. In fact, we have determined that despite these efforts to quit, and intentions to quit, cigarette smoking is the most stable of all the drug using behaviors. (Jerry will show the supporting statistics in just a moment.) We believe that the dependence producing nature of the drug likely explains most of the observed high level of stability in smoking behavior, which in turn could account for much or all of the enduring cohort differences which tend to remain beyond the critical early ages of initiation. Clearly the conclusion for prevention is that we must begin intervening very early if we are to have much chance of being effective at preventing smoking.

Alcohol

Alcohol is the last drug we will examine today and, of course, it is the most socially integrated of all of the drug using behaviors. *(Figure 14)* An examination of the monthly prevalence of alcohol use in the Class of 1976 shows a slight rise in use in the first few years after high school, then a leveling for a time, followed by some decline.

(Figure 15) As we look at similar age curves for all the subsequent cohorts, we see that the profile derived from the first cohort predicted pretty well the profile of future ones -- perhaps not a surprising finding considering just how socially integrated drinking behavior is.

In addition to finding this consistent age effect -- that is, a rise in alcohol use from ages 18 to 21 -- we also find a modest secular trend, reflecting a slight decline across all age groups after 1979. This is interesting in part because it relates to the "displacement hypothesis" commonly heard several years ago -- namely that as marijuana use declined, alcohol use would rise to take its place. So far, our data have tended to refute that hypothesis. It appears that alcohol use has moved in parallel with illicit drugs, rather than opposite to them, at least during the past couple of decades.

It might be mentioned that our measure of heavy drinking shows a slightly different age profile than does the 30-day prevalence of any use. The prevalence of heavy drinking (which we define as having five or more drinks in a row) does show a similar increase between the ages of 18 and 21; however, after age 21 there follows a consistent decline in such behavior. This suggests the possibility of a college effect, of course, given that the highest rate of such heavy drinking occurs at what is the normal college age-band; but again this is a subject to which Jerry will return in just a moment.

To summarize this portion of the presentation: looking at four of the most important classes of licit and illicit drugs, we have identified three quite different types of effects going on among American adolescents and young adults over the past decade. Secular trends were found for three of the drugs -- with alcohol use declining slightly in recent years among all age groups; marijuana use declining more sharply (following a long period of increase); and cocaine use having increased sharply in the late 70's, followed by a period of stability.

Consistent age effects (that is, increases with age) after high school were found for alcohol, cocaine, and cigarettes -- but not for marijuana. (In the case of marijuana, what originally looked like age effects were really secular trends.) There is also some drop in the occasions of heavy drinking after age 21.

Only cigarettes showed a significant cohort effect; but that was quite a dramatic one.

We have also noted that the classes of explanatory variables appropriate to explaining these three different types of change differ both in content, and in the time period in which they can be assumed to have operated. We have tried to demonstrate that in the analysis and interpretation of observed social changes, it is important to know which kind of change is occurring, in order to know which class of potential explanatory variables to pursue.

Jerry is now going to discuss still a fourth type of change which can be addressed in a panel study, and that is differential change with age as a function of social environments entered, or social roles adopted, in the years following high school.

Jerald G. Bachman, presentor

PATTERNS OF CHANGE AND STABILITY IN POST-HIGH SCHOOL DRUG USE

We have just seen how drug use can change across time periods, how it can differ across age groups, and how it can differ from one cohort to another. Now I want to expand our focus still further to include individual differences in drug use. We'll be looking at the different ways in which drug use changes after graduation from high school.

Stability in Drug Use

Actually, the most impressive finding about drug use after graduation is not the extent to which it changes, but rather the extent to which it remains fairly stable. Indeed, by far the best predictor of drug use in young adulthood is drug use during high school. The next figure shows our estimates of the true correlations between senior year drug use and use one, two, or three years beyond high school.

(Figure 16) Note that the stability estimates for cigarette use are distinctly higher than the estimates for other types of drug use. As Lloyd has already indicated, we think physical dependency plays a very strong role here; the majority of the smokers in our surveys would prefer not to smoke, and many have tried unsuccessfully to quit.

Except for smoking, however, we suspect that drug use in our samples is affected more heavily by a broad range of social factors than by physical dependence. But if young people have many new social experiences after high school, why is it that their drug use remains so stable? We think the answer is that many important social and psychological factors do not, in fact, change abruptly upon graduation. Let me give you some examples:

Peer attitudes, pressures, and practices are strongly linked to drug use. Although most young people leaving high school do take on some new roles, experience new social environments, and make some new friends, many also hold on to old friends and social habits.

Parental attitudes and practices also influence youthful drug use, and these continue to have some effect -- especially, as we shall see, among those young adults who continue living in their parents' homes.

Religious commitment is yet another important influence on drug use, and for most young people this factor tends to be relatively stable during the post-high school years.

The fact that many of these influences are fairly stable means in turn that patterns of drug use which are established during high school will continue mostly unchanged during the first few years after graduation.

Changes Linked to Post-High School Experiences

But against this backdrop of considerable stability, we have also found that when young people take on new roles and responsibilities, there do seem to be corresponding changes in their drug use.

Graduation obviously marks the end of the high school student role. The two most widely chosen replacement roles are full-time student (usually in college) and full-time civilian employee. Let us see whether these roles have different implications for change in drug use.

(Figure 17) This figure shows proportions who reported heavy drinking (five or more drinks in a row) during the past two weeks, both as seniors and as graduates one to three years beyond high school. The trend lines show a substantial increase in the likelihood of heavy drinking among the full-time students, compared with little overall change among those in full-time civilian jobs. (Incidentally, the figure also shows the distinctly higher proportions of males, compared with females, who drink at that level.) The other important thing to observe in this figure is that the increases among students represent a sort of "catching up" or "closing of the gap." In high school, those who plan to go to college show much lower than average levels of alcohol use and drug use in general.

(Figure 18) The next figure provides data for current marijuana use, and we can see much the same sort of pattern -- a "catching up" on the part of the college students. I should add that a similar pattern also emerged when we examined an index of other illicit drug use.

Now we come to a very interesting question: what is responsible for these changes? Is it that these students have somehow been corrupted by their liberal professors? Or could it be that the heavy demands of academic work drive students to drink and drugs? Before jumping to any such conclusions, let us consider some other important changes which many young people make during the first years after high school.

With each year beyond graduation, increasing numbers of young adults move out of their parents' homes. In some cases they live on their own or with friends or dorm-mates, and in other cases they marry and set up new households of their own. It seemed to us that these changes in role responsibilities, and the accompanying changes in social environments, would have some impacts upon drug use.

Marriage and life with a spouse often involve new responsibilities and commitments, and perhaps also significant changes in friends, acquaintances, and leisure activities. We expected that most of these changes would reduce any tendencies toward heavy drinking or the use of illicit drugs.

On the other hand, we expected that other young people moving out of the parental home (but not marrying) might show increases in drug use, because of greater time spent with peers and reduced contacts with parents.

(Figure 19) This next figure shows that our expectations were pretty much confirmed with respect to heavy drinking. Those who, at the time of the follow-up, were married and living with spouse (labelled "S" in this chart) showed a decline in heavy drinking after high school; those who continued to live with their parents (labelled "P") showed relatively little overall change

(especially among females), whereas those who entered most other living arrangements (labelled "O") showed an increase in heavy drinking after high school.

(The fourth group consists of relatively small numbers -- three percent of males and five percent of females -- who, at the time of the follow-up, were living with a cohabitant of the opposite sex. The findings are somewhat mixed for them, so far as heavy drinking is concerned.)

(Figure 20) The findings for marijuana use are a bit sharper in two respects. First, we can see quite clearly for both males and females that the proportions of marijuana users declined among those who married, stayed the same among those continuing to live with parents, and rose among those in most other living arrangements. Moreover, we can see that these three groups started out in high school with just about equal proportions of marijuana users, and then diverged as living arrangements changed. The second clear finding shown in this figure is that those who became cohabitants after high school were above average in marijuana use both as seniors and as graduates. Here again when we repeated the analysis using a measure of other illicit drug use, we found much the same pattern of findings as for marijuana use.

(It is useful at this point to stop and imagine how limited our knowledge would be if we had only the "after" or follow-up data shown in this figure. We would know that marijuana use is lower than average among the married; and among the unmarried we would know that use is higher among those living away from home. But we would be left to wonder whether these distinctions reflect long-standing individual differences rather than possible results of the post-high school living experiences. And, on the other hand, we could look at the cohabitants and wonder whether living with someone outside of marriage leads to a dramatic upswing in marijuana use. Clearly, the panel data add a great deal to our understanding.)

The findings about marriage and living arrangements seem clear enough when examined alone, but how do they relate to the changed drug use levels among college students shown earlier? First of all, it is clear that the two dimensions of post-high school experience are related to each other. College students are more likely than others to have left the parental home, and they are considerably less likely to have gotten married. In other words, the living arrangements associated with college appear conducive to increased drug use. So the question then becomes, if we first take account of living arrangements and marital status (that is, if we control them statistically), do we then see any additional effect on drug use that could be attributed to being a college student? We have done that analysis in some detail, and the consistent answer -- at least for the first few years after high school -- is that the entire "college" effect seems attributable to living arrangements and marital status. So that would seem to get those liberal professors off the hook. (Or maybe they just aren't as liberal as is often alleged!)

The findings I've just reviewed show up fairly consistently across several dimensions of drinking and drug use. Moreover, when we add further statistical controls to take account of the secular trends in marijuana use, which you saw earlier, the effects still remain. But now let me quickly show you the one drug which does not show these differential patterns of change linked to post-high school experiences.

(Figure 21) This figure shows the post-high school increase in proportion of half pack a day cigarette smoking which Lloyd described earlier, but it does not show any appreciable difference in rates of change between those in jobs and those in college. Instead, what we see is a dramatic, constant difference in overall proportions, with college students only one-third to one-half as likely to be regular smokers as those in jobs. But it is not, of course, that going to college enables one to quit; rather, it is that those who are more academically oriented in high school -- and in junior high school, for that matter -- are much less likely to get hooked on smoking in the first place.

(Figure 22) When it comes to marriage and living arrangements, we again see little evidence of differential change. Instead, we see that those groups with the highest proportions of college students have the lowest proportions of smokers.

In sum, while changes in marital status and living arrangements are accompanied by changed likelihood of heavy drinking and illicit drug use, there are no such changes in the likelihood of smoking. As we have observed earlier, cigarette use seems much more resistant to change.

In these figures we have been looking at changes during just the first one to three years following graduation. Can these findings from the late teens and very early twenties be generalized to the mid-twenties? In particular, does the decline in drug use associated with early marriage appear also for those who marry later? We have been working on these questions, and I'd like to give you a glimpse at some early results.

(Figure 23) Here we are looking at the same measure of heavy drinking we saw earlier, but now we are tracking males across four follow-ups, or until they have reached their mid-twenties. We wanted to see whether the drop in drinking we found with early marriages showed up for those who married later in their twenties. Without trying to sort out all the details, just concentrate on the heavily shaded portion of each trend line, because that is the interval in which the transition into marriage occurred. What you can easily see is that all four heavy lines slope downward sharply. In other words, no matter whether marriage occurs in the first couple of years after graduation, or six to eight years after graduation, during the interval in which marriage occurs the prevalence of heavy drinking also declines.

(Figure 24) This next figure shows the same general pattern among females; during the interval in which they went from unmarried to married, their average involvement in heavy drinking declined.

(Figure 25) Much the same can be said for marijuana use among males.

(Figure 26) And also among females.

What is it about marriage which leads to the decline in heavy drinking and in use of other drugs? That is a topic which we are currently exploring. Certainly one of the factors involved is the commitment to another person and concern about that person's feelings and wishes. When asked reasons for not using marijuana, for example, married respondents were particularly likely to check the answer "My girlfriend, or boyfriend, or spouse would disapprove." Moreover, we have found that when young people become engaged their heavy drinking and drug use decline somewhat -- though not as much as when they then become married.

Another factor which seems to change when young people become married is that they spend fewer evenings going out for fun and recreation -- but I hasten to add that when we ask "how often do you go out with a date (or your spouse, if you are married)?" the rate does not change. So it appears that "evenings out with the gang" are what is reduced after marriage, and our other analyses have shown that such evenings out are highly correlated with use of alcohol and other drugs. This is one of a number of areas that we will be exploring further in the coming months.

CHANGING MARIJUANA USE LINKED TO CHANGING PERCEPTIONS OF RISK

Now I'd like to leave the complexities of longitudinal panel analyses and spend a final couple of minutes on a topic which Lloyd raised earlier -- the relationship between perceived risk and drug use. It will come as no surprise that at the individual level of analysis perceived risks, and other attitudes about drugs, are all strongly correlated with actual drug use. Moreover, in the case of

marijuana, we have observed that the downward secular trend in use was anticipated by a larger shift in perceptions of risk.

(Figure 27) This figure places those two trends side by side. The lower solid line shows that in 1976 through 1978 about 13 to 14 percent of seniors said they saw no risk in marijuana use, but in the early eighties only three or four percent saw no risk. The lower dashed line shows that daily marijuana use reached a peak close to 11 percent in 1978, but then declined to only about five percent in the mid-eighties. Similarly, the upper pair of lines shows a dramatic decline in the percentages who saw at most a slight risk in regular marijuana use, coupled with a later and more modest decline in percentages of monthly marijuana users.

As Lloyd mentioned, we felt for some time that the most plausible explanation for this particular set of trends was that shifting perceptions about marijuana contributed significantly to the decline in use. But just showing that these two dimensions are correlated, or that they have similar secular trends, is not necessarily convincing. Indeed, there are always at least three ways of interpreting a correlation between two variables, as this next figure illustrates:

(Figure 28) If variables A and B are correlated, it may be that A causes B, or that B causes A, or that some other variable (or set of variables), which we'll call C, causes both A and B. (And, of course, these are not mutually exclusive.) Conveniently, we can let A stand for Attitudes about marijuana, and let B stand for marijuana using Behaviors, and let C stand for "Conventionality" or "Conservativism" -- which was one of the interpretations Richard Jessor proposed as a possible explanation for our findings.

It is no coincidence that Jessor suggested a shift in "conventionality" might underlie the decline in marijuana use. His studies, and our own as well, have shown that there are a variety of factors associated with drug use -- and other deviant behavior, for that matter -- which can be lumped together under the general heading of conventionality. These include successful adaptation and performance in school, spending time at home rather than being out most evenings, and commitment to religion, to name just a few. Individuals who are high on these dimensions tend to be low in the use of marijuana, and low also in the use of other drugs, including alcohol.

So could it be that the decline in marijuana use signals a growing conventionality or conservativism among young people? Is it that kids are simply getting "better" or "straighter" these days? As it turns out, that explanation does not fit the data very well.

First of all, while levels of marijuana use declined in the first half of the eighties, we did not see a corresponding decline in cocaine use, or any substantial downturn in heavy drinking, or any appreciable drop in delinquent behavior in general. Such changes would have been expected under the Jessor hypothesis.

Second, when we looked closely at each of a number of possible indicators of conventionality, we found that none of them had changed very much over the past decade -- certainly not enough to account for the shift in marijuana use.

Third, when we tried controlling each of these indicators of conventionality statistically, we found the downturn in marijuana use remained quite clearly. The next figure provides an interesting example.

(Figure 29) Here we can see first that those with a low commitment to religion were consistently more likely to use marijuana, but we can also see that marijuana use among these less religious seniors declined quite sharply in the eighties -- indeed, it declined more than average, no doubt because there was more room for them to move. To put it another way, this figure suggests that those with a high commitment to religion may have been shielded, to some extent, from the

secular trends in marijuana use -- they didn't participate much in the rise in use, and thus they could not participate much in the decline. (Incidentally, we found similar patterns for other aspects of conventionality -- in each case, the secular trends were generally more pronounced among those in the "high risk" categories.)

We also tried controlling all of the measures of "conventionality" simultaneously, but that didn't explain the secular trend in marijuana use either. In sum, the "C causes both A and B" interpretation just doesn't wash, in this case.

On the other hand, when we looked at perceptions of risk, quite another picture emerged, as the next figure shows.

(Figure 30) Here we can look across the past decade and see whether there has been any recent decline in marijuana use among those who saw little or no risk in regular use, those who saw moderate risk, and those who saw great risk. There was little overall change among those who saw little or no risk; they consistently averaged near "5" on this scale, which corresponds to about ten to twenty uses of marijuana during the prior year. At the other end of the scale, those who perceived great risk showed very little use ("1" on that scale refers to zero use, "2" denotes use once or twice during the past year), and that didn't change much either -- especially after 1980.

So what is it that has been changing? As we saw a few moments ago, the big change occurred in the *proportions* of seniors in these groups. In 1978 more than a third of all seniors were in the "no risk" or "slight risk" category, but by 1986 less than seven percent were. During the same period, the "great risk" category increased from just over a third to three quarters. In other words, the relationship between perceived risk and use did not seem to change very much; what changed is that a great many more seniors took the risks more seriously. And that finding seems fully consistent with the "A causes B" interpretation -- that increased perceptions of risk led to the decline in use.

Could the "B causes A" interpretation work equally well, some may ask? In other words, could the changing trends in marijuana use have caused the changes in perceived risks? We explored that alternative carefully, and the results showed unequivocally that it does not work. The data simply do not fit the "B causes A" interpretation at all well. But I'm afraid you will have to take our word for that part of the story, or ask us for a copy of our latest article on this topic, because I have time left for only a final observation or two.

First it is worth asking why it is that the increase in perceived risks of marijuana occurred. Here we go beyond our data, but we think it was a combination of two things: new and better data on some of the physical effects of marijuana, which were well reported in the media, plus the fact that by the late seventies nearly any high school student could observe at first hand at least a few classmates who had used marijuana enough to demonstrate the resulting loss of interest in school, poorer grades, etc.

Are there implications for other drugs? We expected that the dramatic death of Len Bias, and other recent events, would prompt rising perceptions of risk and corresponding declines in the use of cocaine. We should find the answer in our analyses of the 1987 survey data collected only a few months ago, so stay tuned.

CONCLUDING NOTE

We have covered a lot of ground in the past hour, discussing various changes in drug use, various reasons for change, and also noting some of the ways in which our research design has proven especially valuable in helping us avoid a variety of pitfalls.

A statement some years ago by Lee Cronbach was included in our first Monitoring the Future proposal, and we continue to think it applies: "Generalizations decay. At one time a conclusion describes the existing situation well, at a later time it accounts for rather little variance, and ultimately it is valid only as history."

We think the sort of research design and approach we have been illustrating here today can help us keep track of just how widely we should generalize. Certainly in the fast-changing area of drug use, it does seem safe to say that further research is still needed. For our part, we hope to continue conducting some of that research.

Figure 1

Monitoring the Future
Cohort-Sequential Design

(Entries are Average Ages of Respondents)

	Year of Data Collection											
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Class of 1976	***18***	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*
Class of 1977		***18***	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*
Class of 1978			***18***	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*
Class of 1979				***18***	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*
Class of 1980					***18***	*19*	*20*	*21*	*22*	*23*	*24*	*25*
Class of 1981						***18***	*19*	*20*	*21*	*22*	*23*	*24*
Class of 1982							***18***	*19*	*20*	*21*	*22*	*23*
Class of 1983								***18***	*19*	*20*	*21*	*22*
Class of 1984									***18***	*19*	*20*	*21*
Class of 1985										***18***	*19*	*20*
Class of 1986											***18***	*19*
Class of 1987												***18***

Figure 2

Trends in Thirty-Day Marijuana Prevalence
Class of 1976

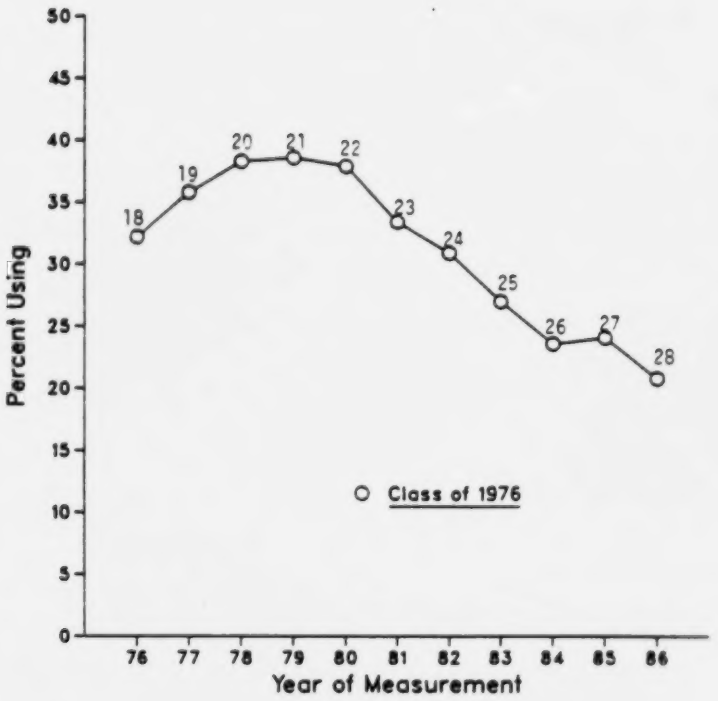

Figure 3

Trends in Thirty-Day Marijuana Prevalence
Class of 1980

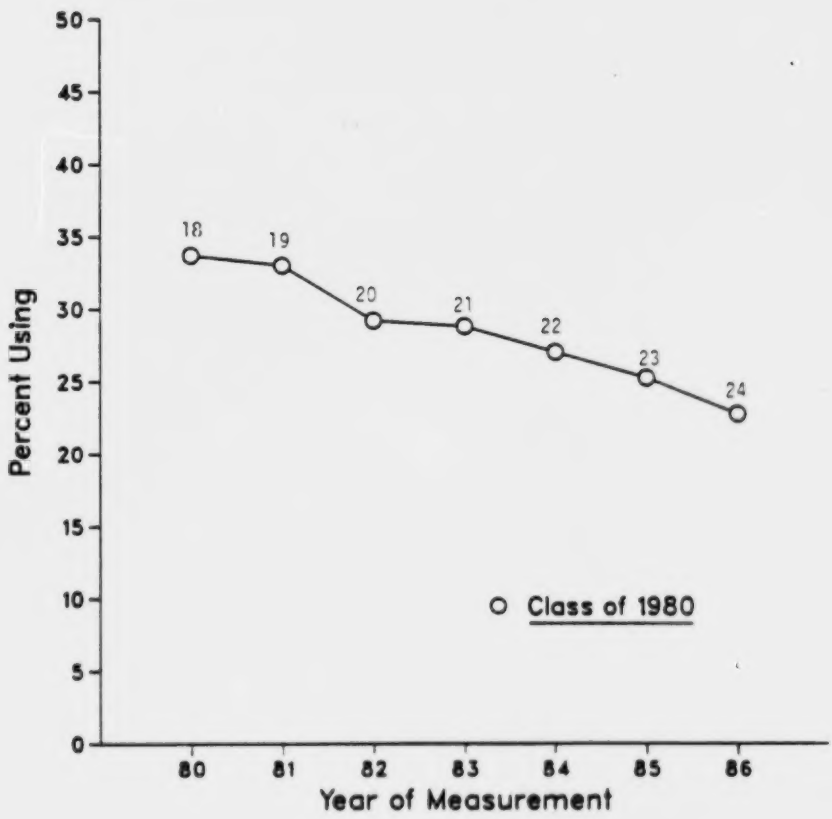

Figure 4

Trends in Thirty-Day Marijuana Prevalence
For Multiple Cohorts

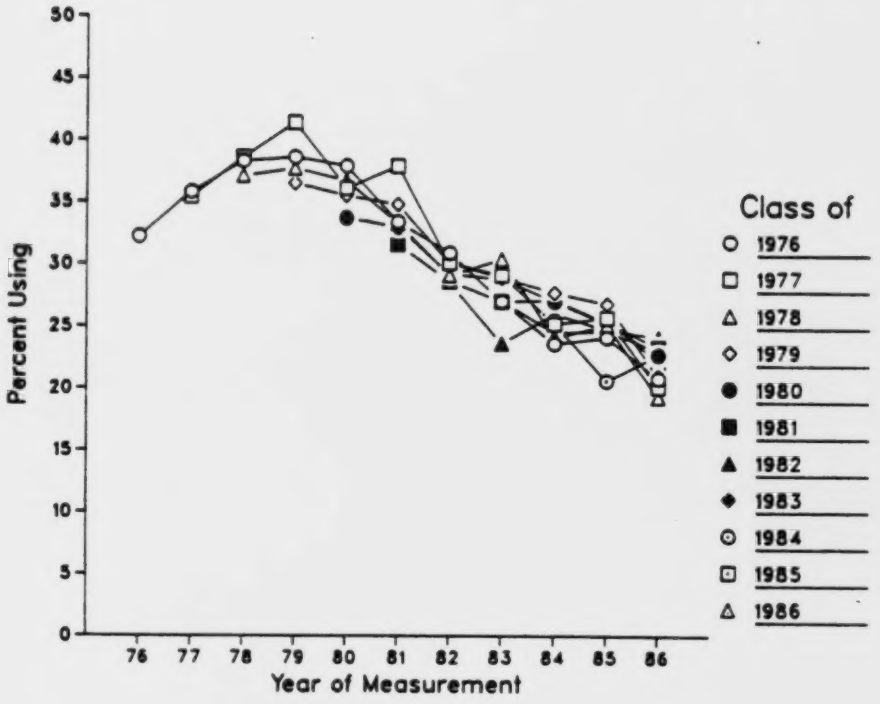

Figure 5

Marijuana: Trends in Lifetime Prevalence for Earlier Grade Levels
Based on Retrospective Reports from Seniors

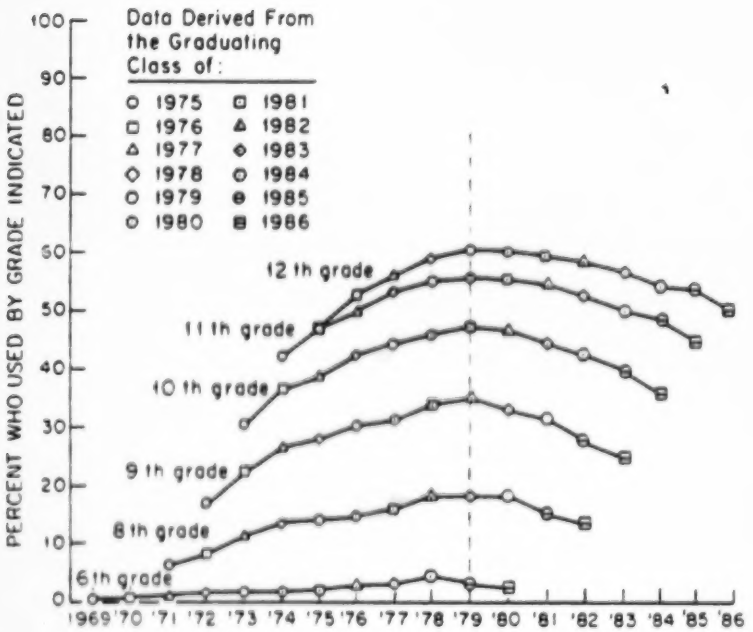

Figure 6

Trends in Perceived Harmfulness of Marijuana

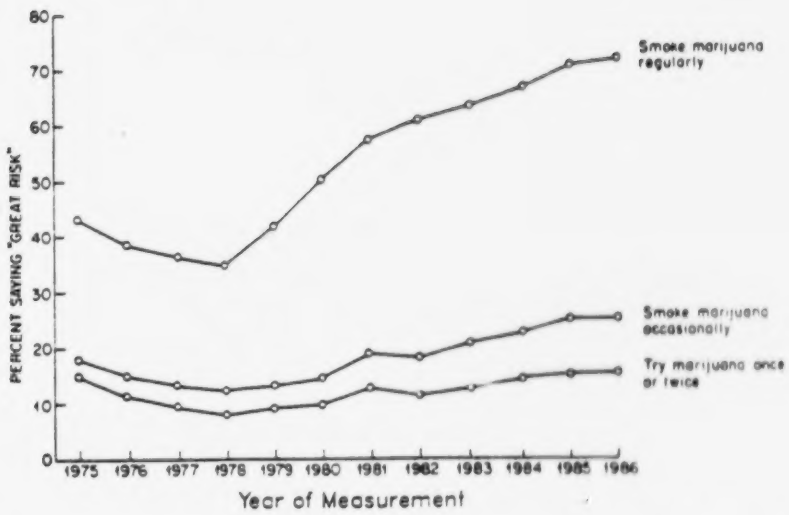

Figure 7

Trends in Annual Cocaine Prevalence
Class of 1976

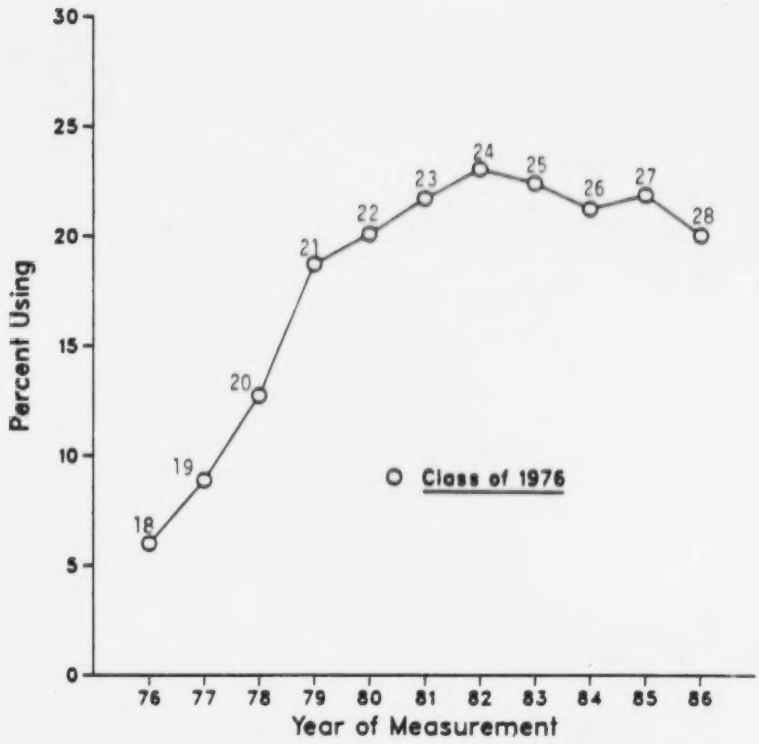

Figure 8

Trends in Annual Cocaine Prevalence
For Multiple Cohorts

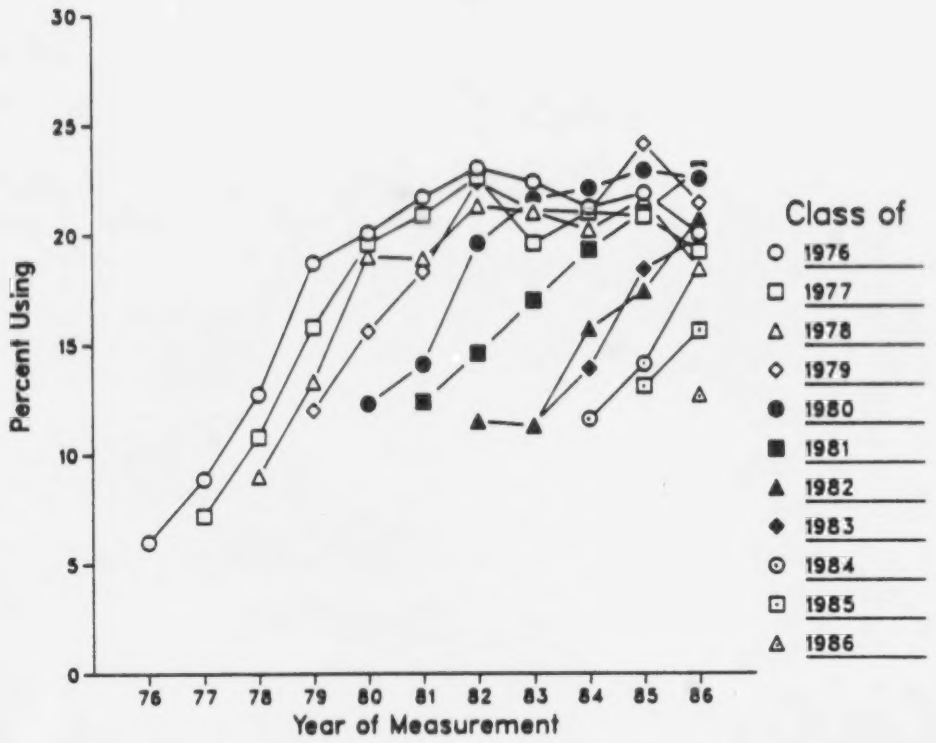

Figure 9

Trends in Thirty-Day Prevalence of Smoking One-Half or More Packs of Cigarettes Per Day
Class of 1976

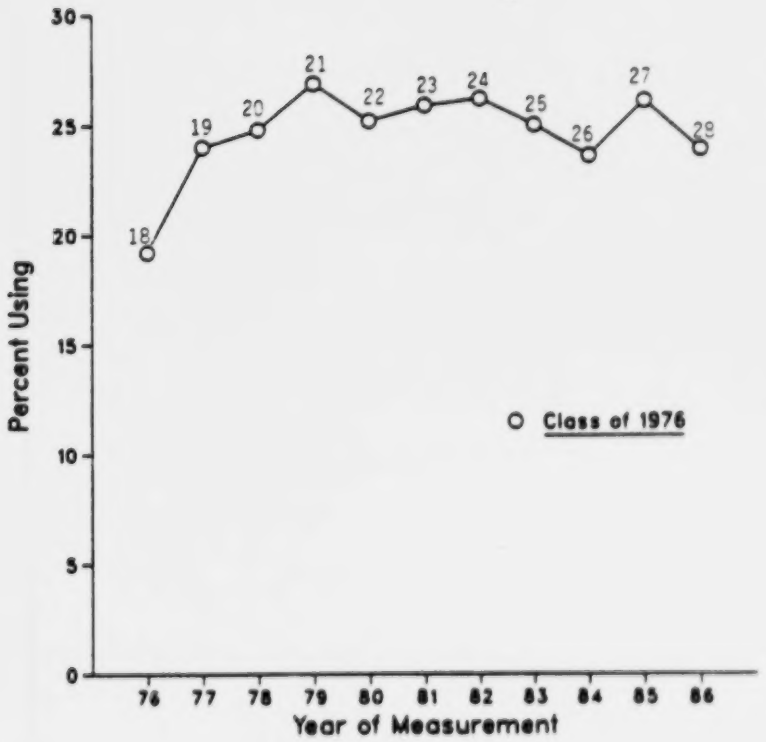

Figure 10

Trends in Thirty-Day Prevalence of Smoking One-Half or More Packs of Cigarettes Per Day
For Multiple Cohorts

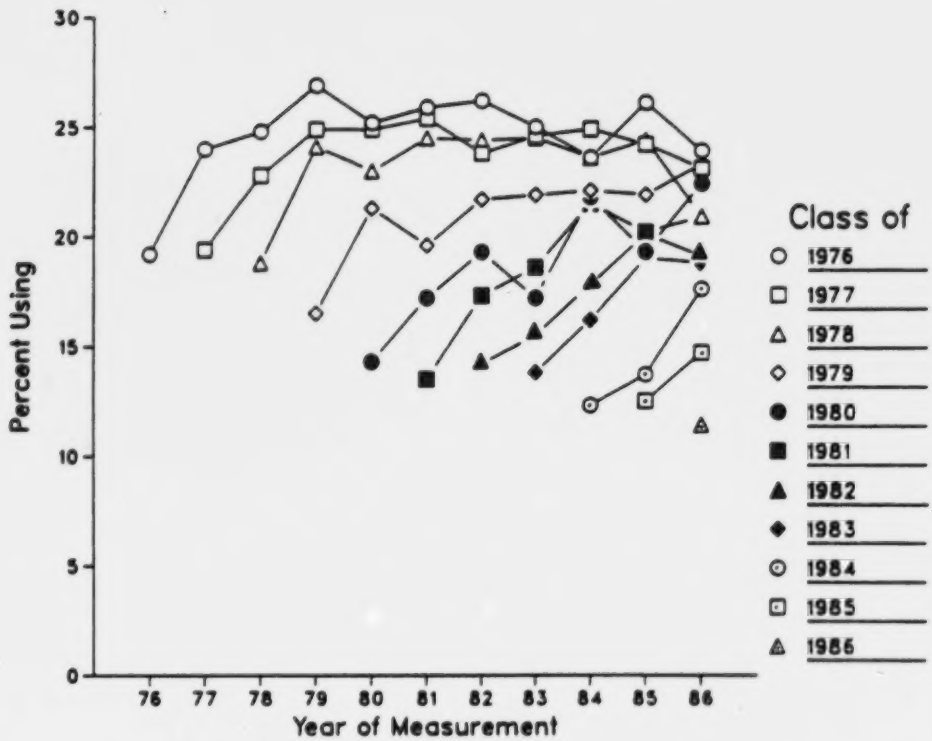

Figure 11

Cigarettes: Trends in Thirty-Day Use of Half-Pack a Day or More
Among High School Seniors

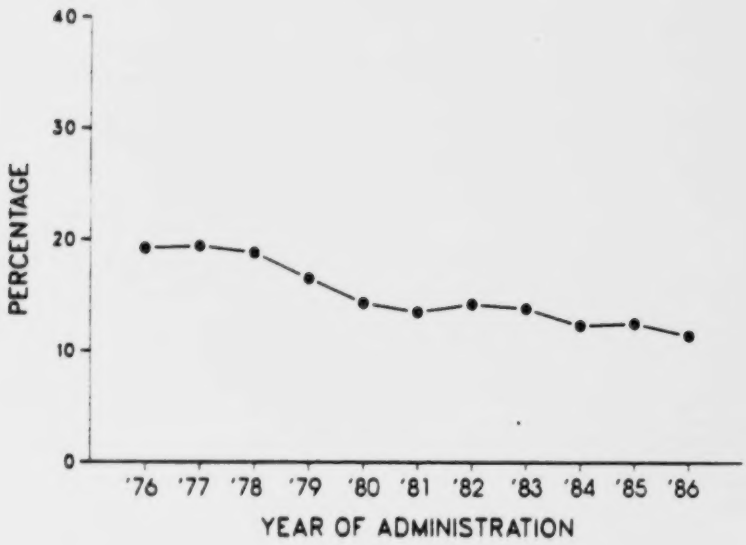

Figure 12

Cigarettes: Trends in Thirty-Day Use of Half-Pack a Day or More Among Young Adults
by Age Group

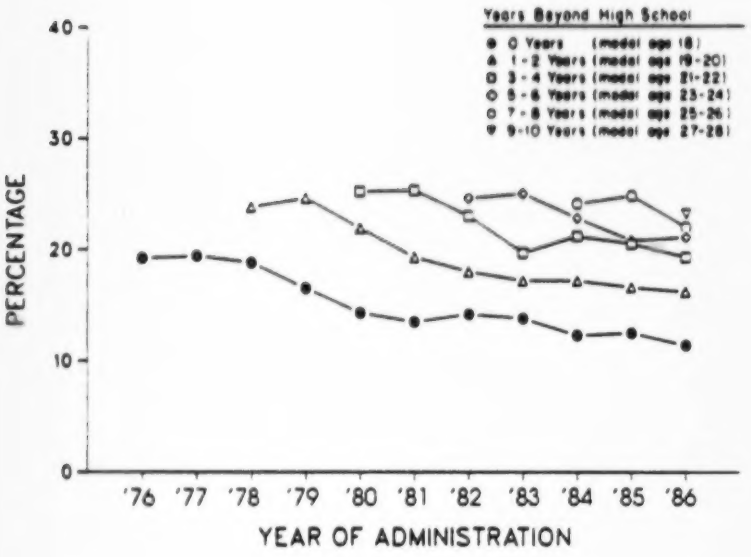

Figure 13

Cigarette Smoking on a Daily Basis: Trends in Lifetime Prevalence for Earlier Grade Levels
Based on Retrospective Reports from Seniors

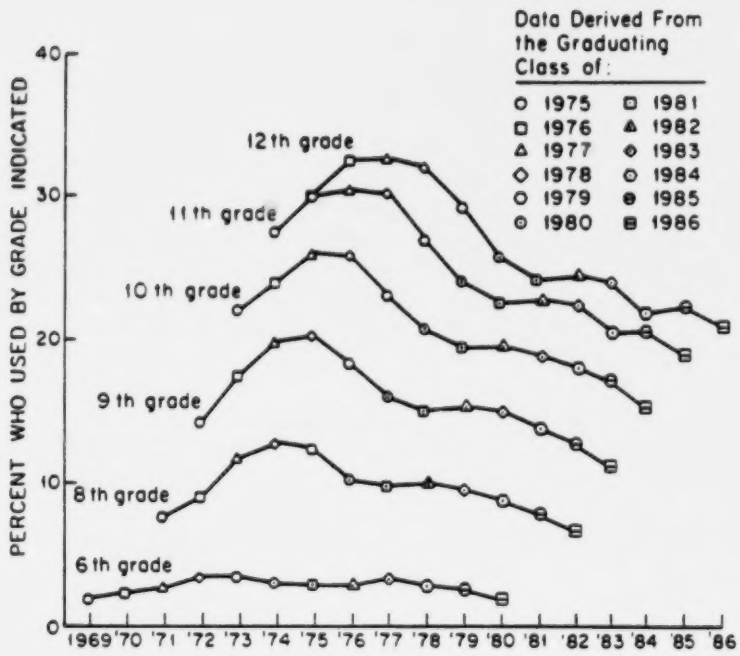

Figure 14

Trends in Thirty-Day Prevalence of Alcohol Use
Class of 1976

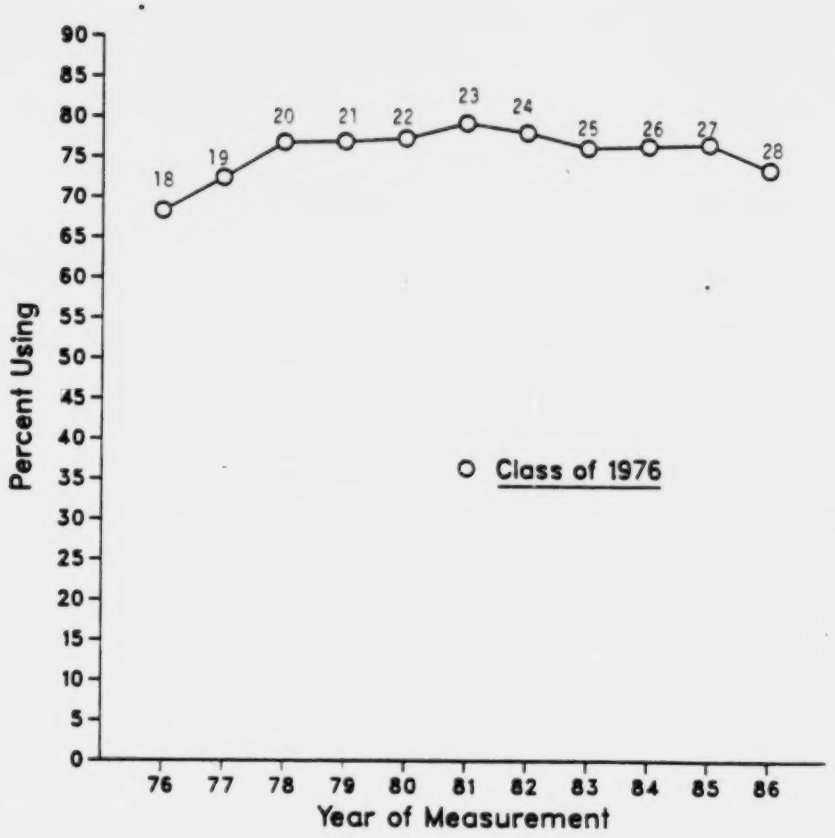

Figure 15

Trends in Thirty-Day Prevalence of Alcohol Use
For Multiple Cohorts

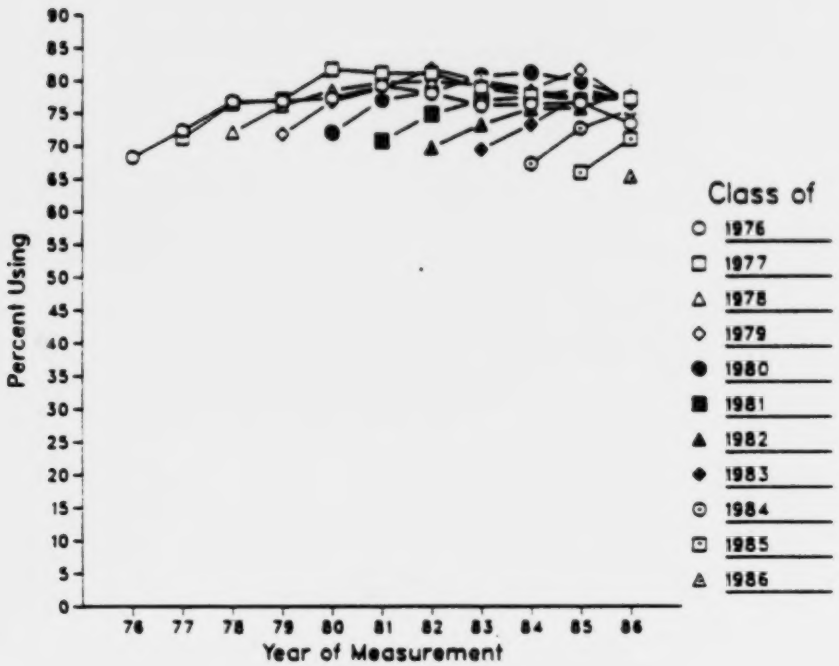

Figure 16

Estimated Stability of Drug Use

Drug use measure	Estimated reliability	Estimated stability (correlations with base year, corrected for measurement reliability) 1-year follow-up	2-year follow-up	3-year follow-up
Cigarette use in past month	.89	.89	.82	.79
Heavy drinking in past 2 weeks	.64	.80	.72	.65
Alcohol use in past year	.87	.81	.75	.67
Marijuana use in past year	.90	.85	.73	.66
Other illicit drug use in past year	.73	.82	.66	.58

Figure 17

Heavy Drinking Related to Student/Employment Status

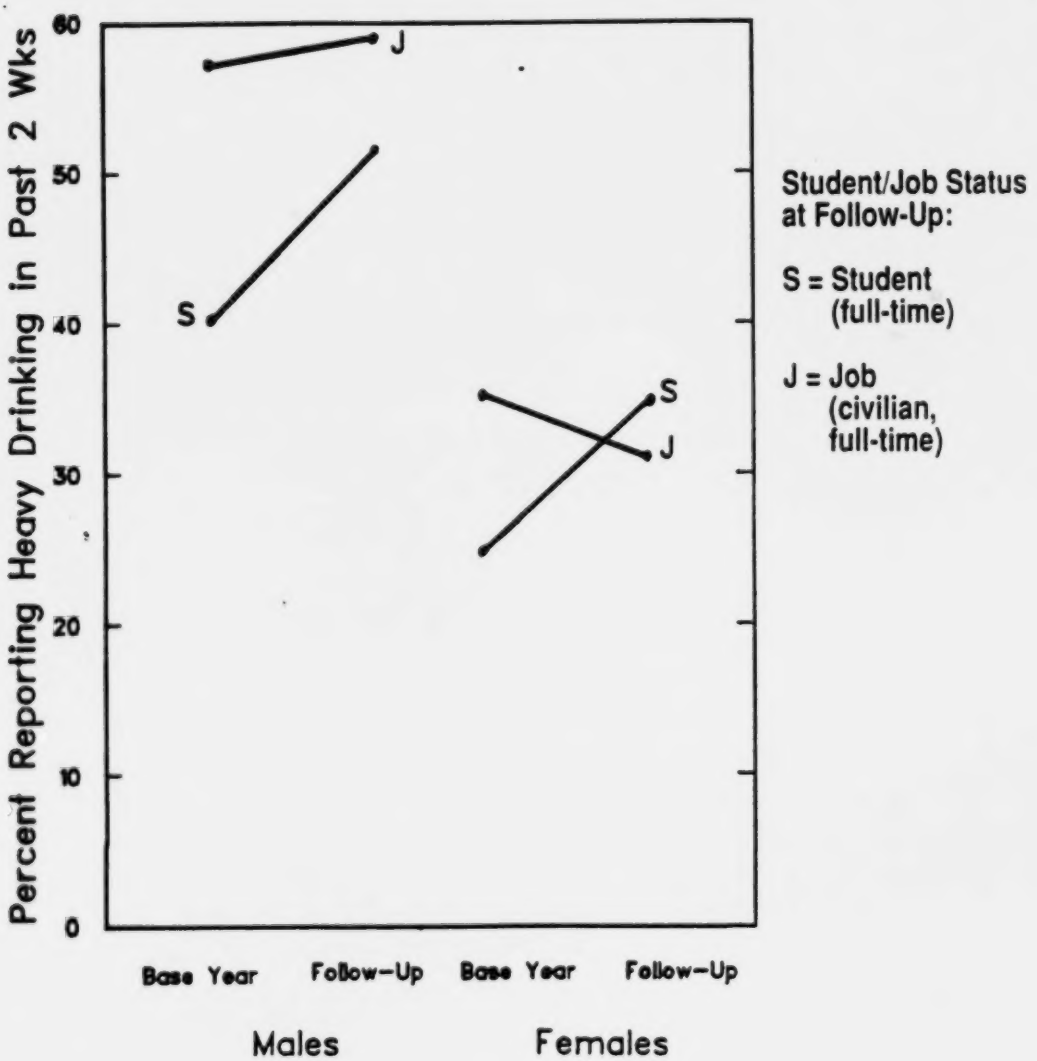

Figure 18

Marijuana Use Related to Student/Employment Status

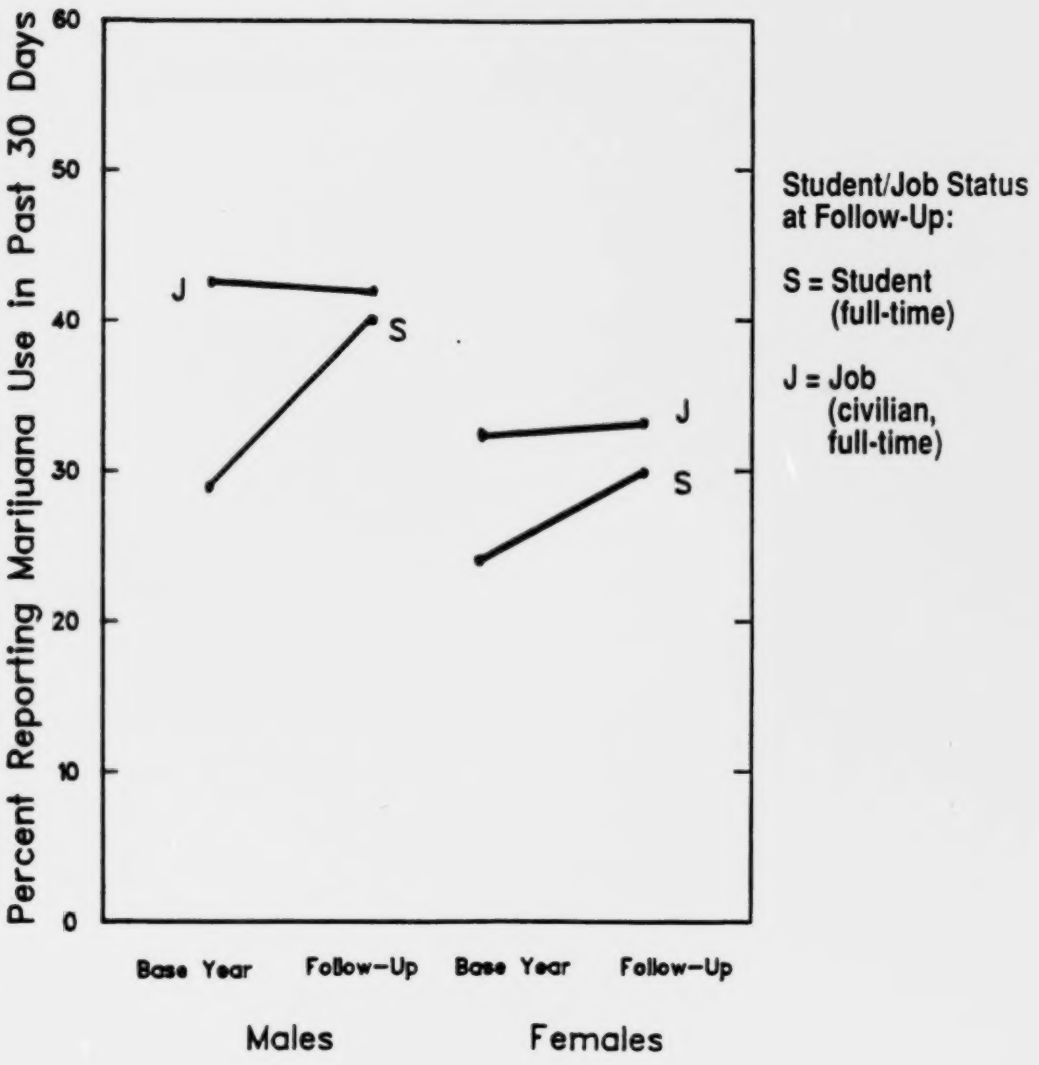

Figure 19

Heavy Drinking Related to Living Environment

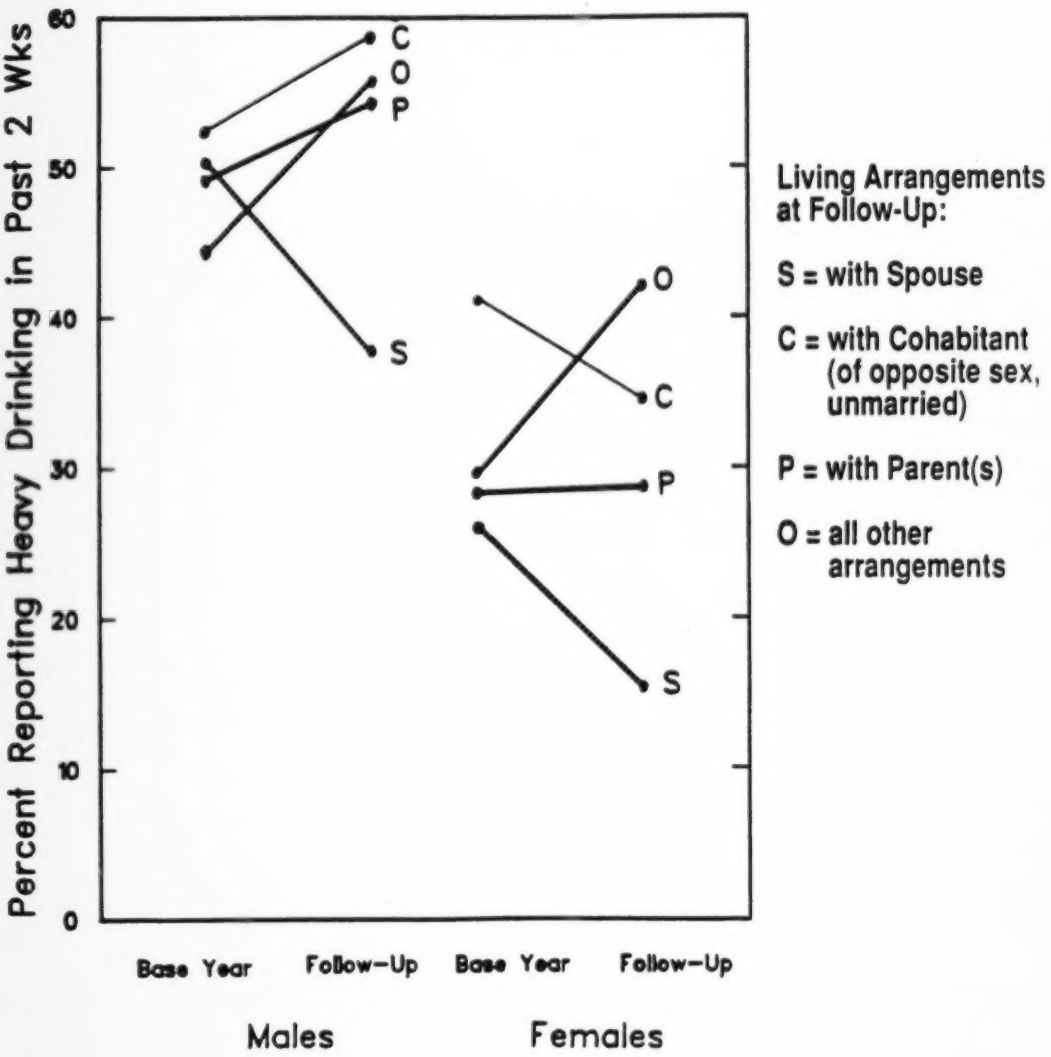

Figure 20

Marijuana Use Related to Living Environment

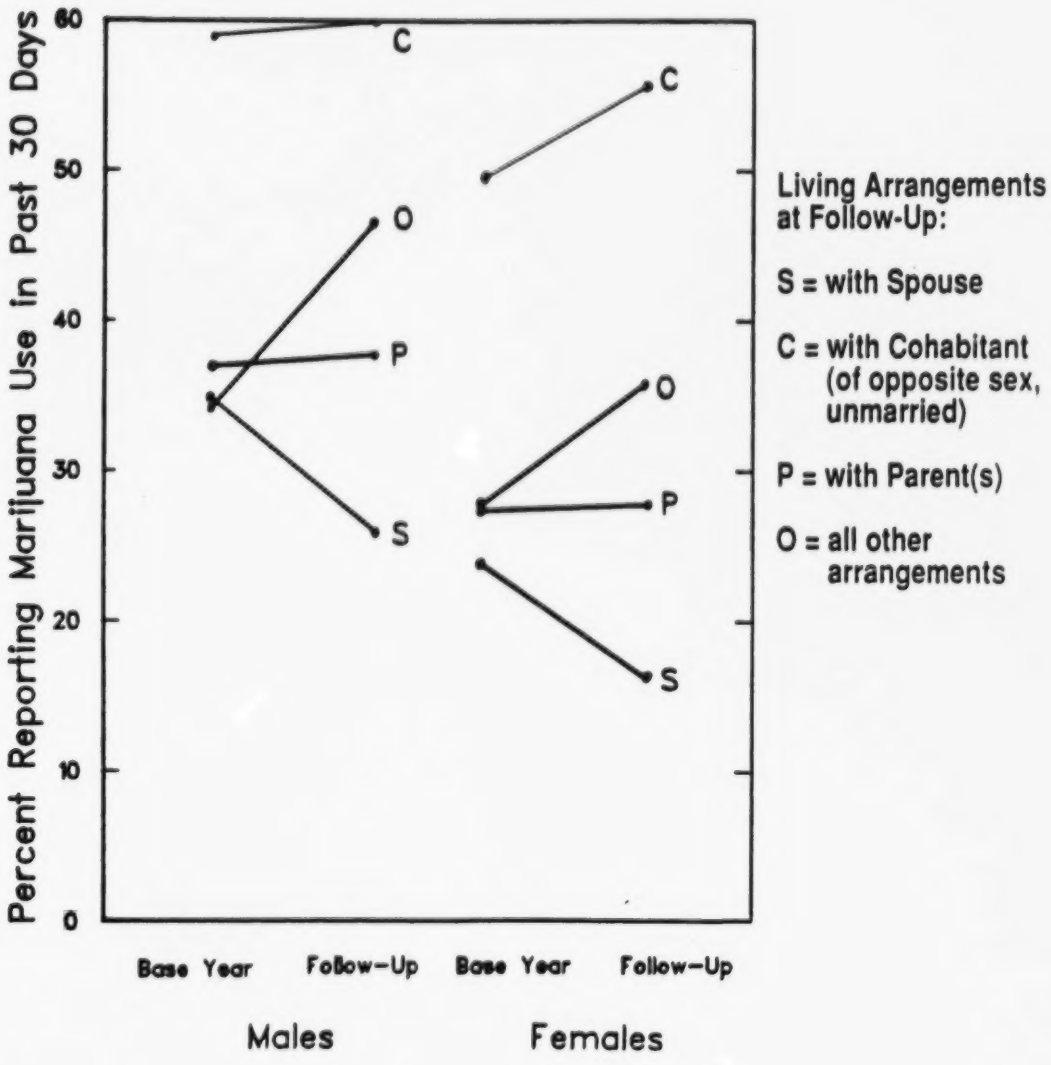

Figure 21

Cigarette Use Related to Student/Employment Status

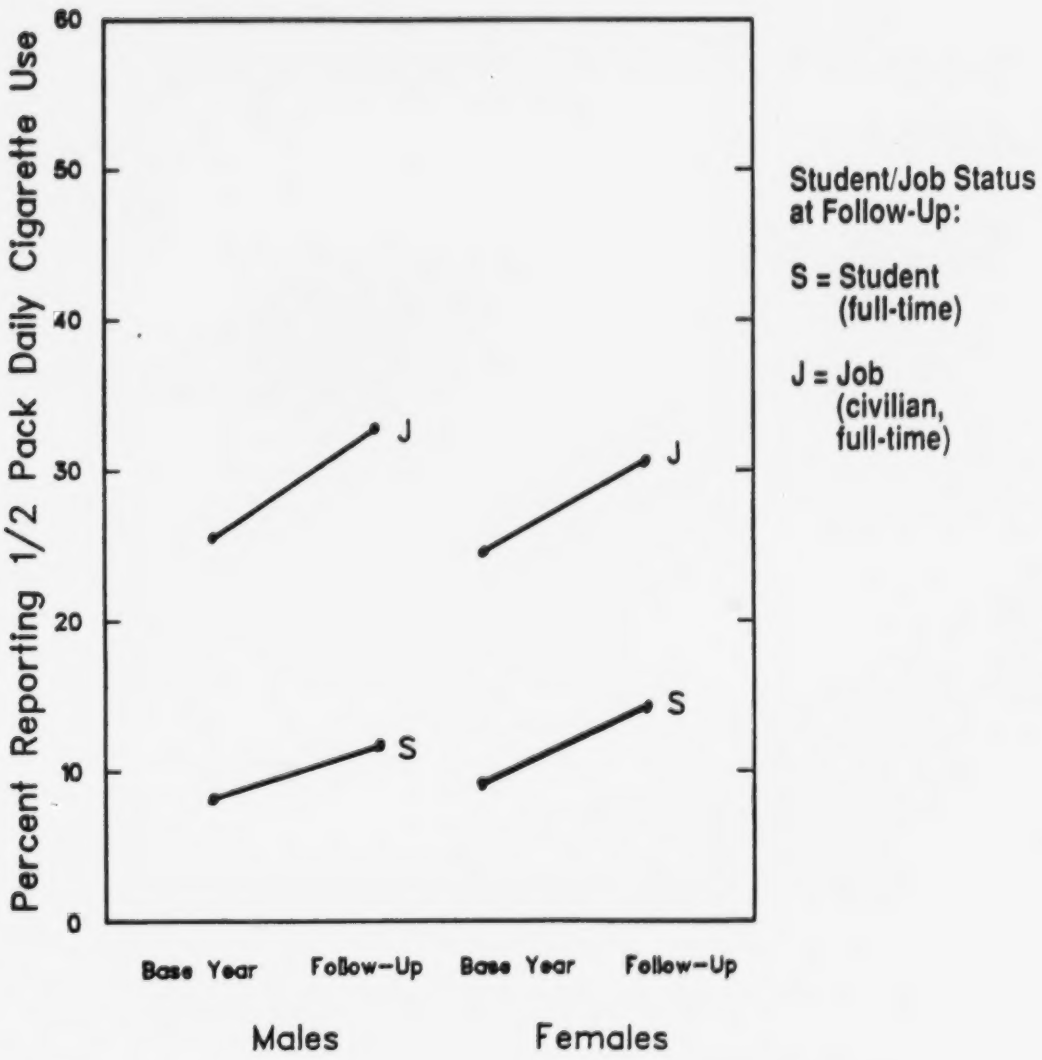

Figure 22

Cigarette Use Related to Living Environment

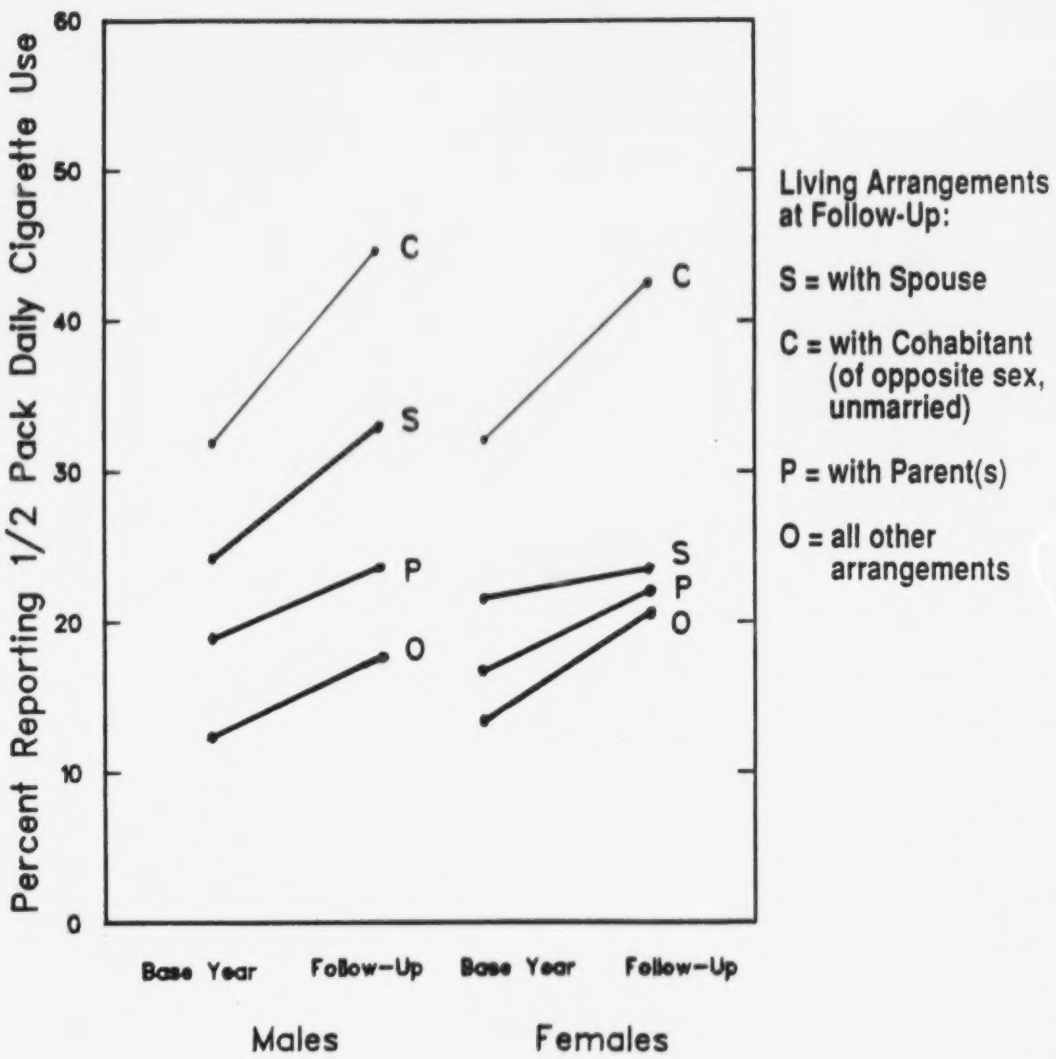

Figure 23

Heavy Drinking Related to Marital Status, Males

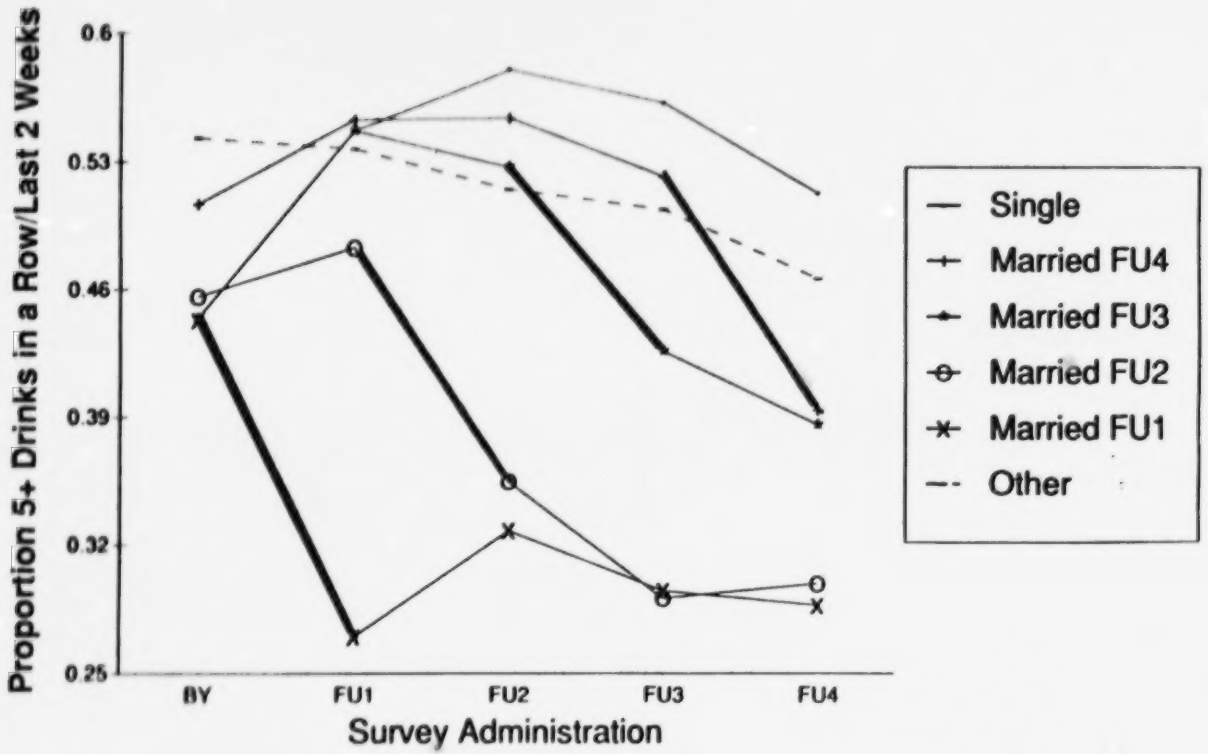

Figure 24

Heavy Drinking Related to Marital Status, Females

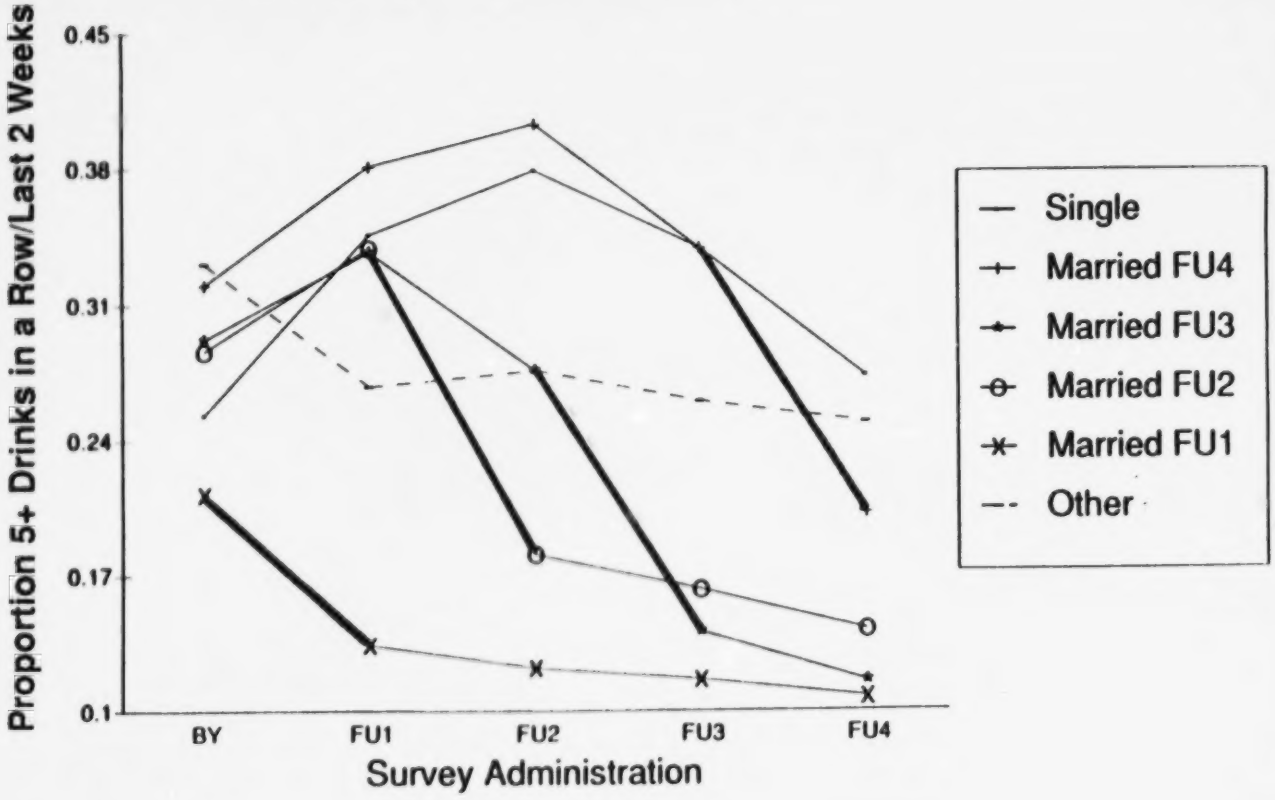

Figure 25

Marijuana Use Related to Marital Status, Males

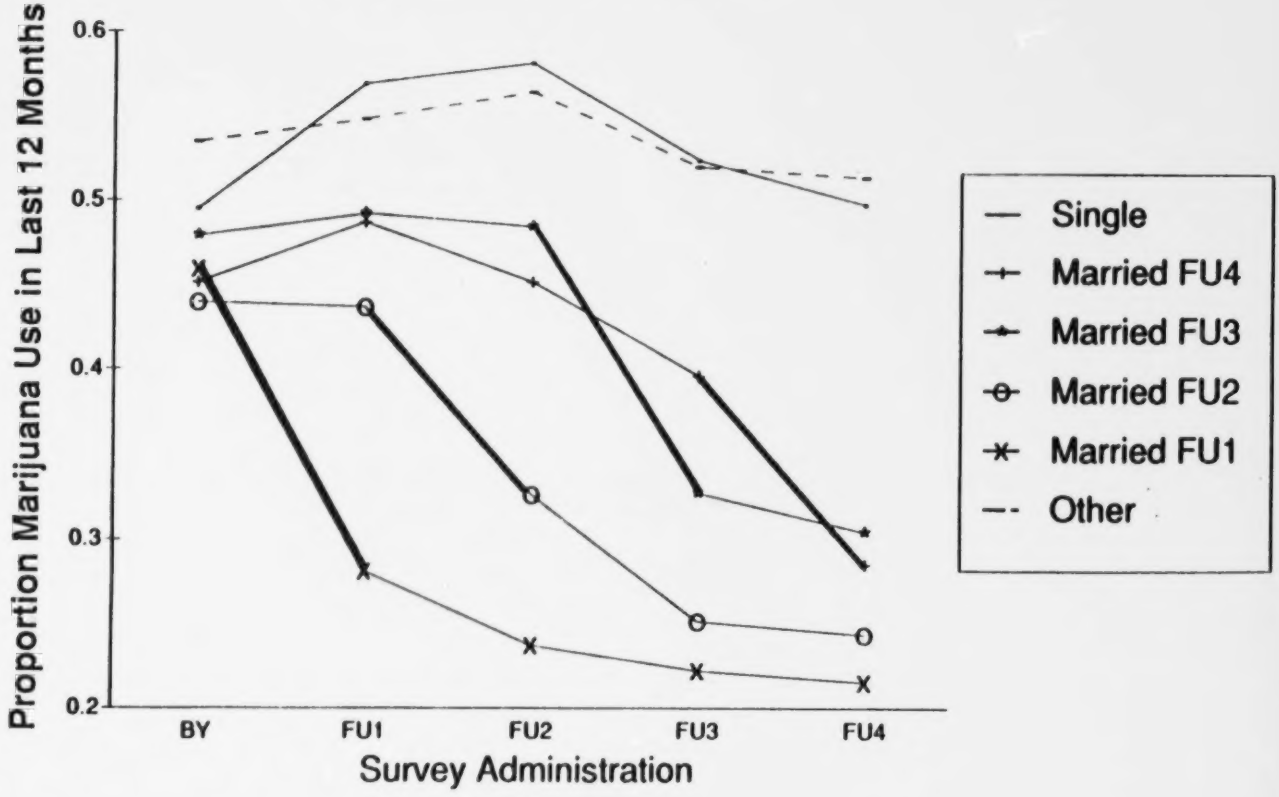

Figure 26

Marijuana Use Related to Marital Status, Females

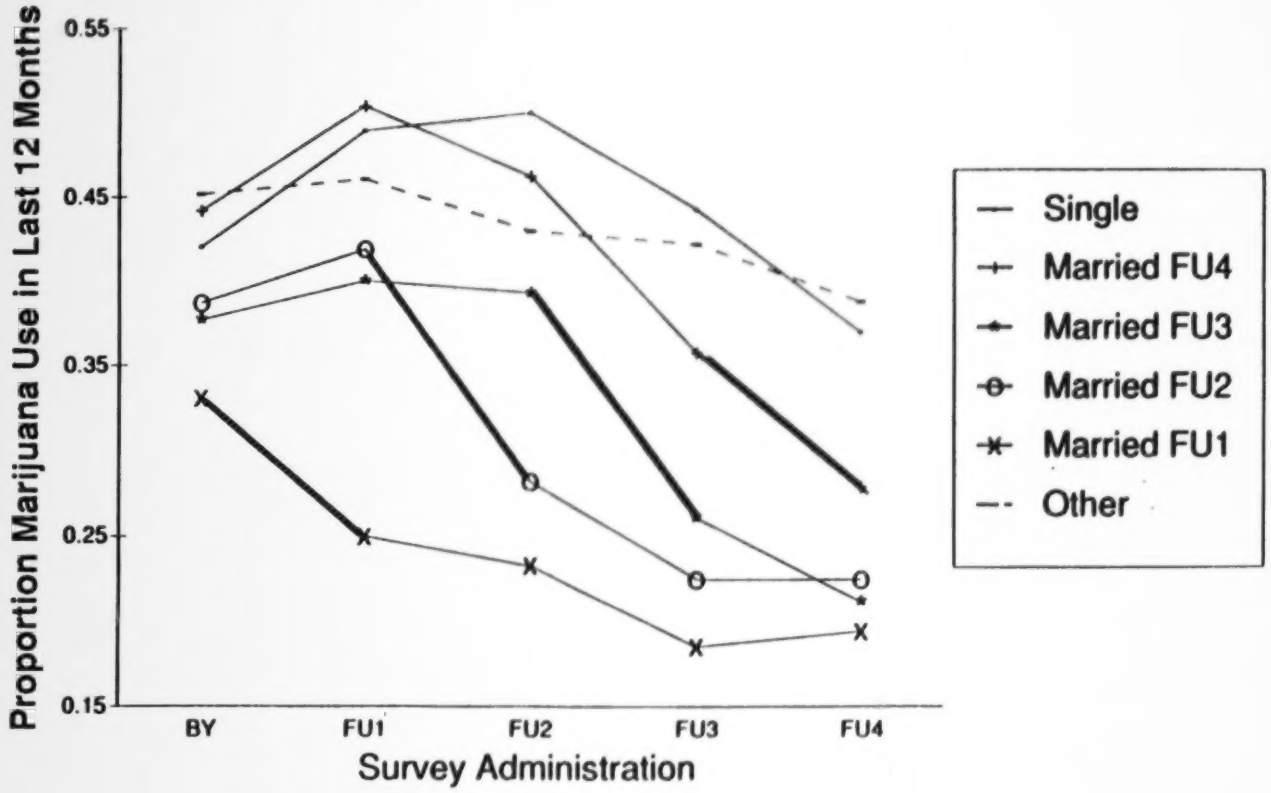

Figure 27

Trends in Marijuana Use and Perceived Risk

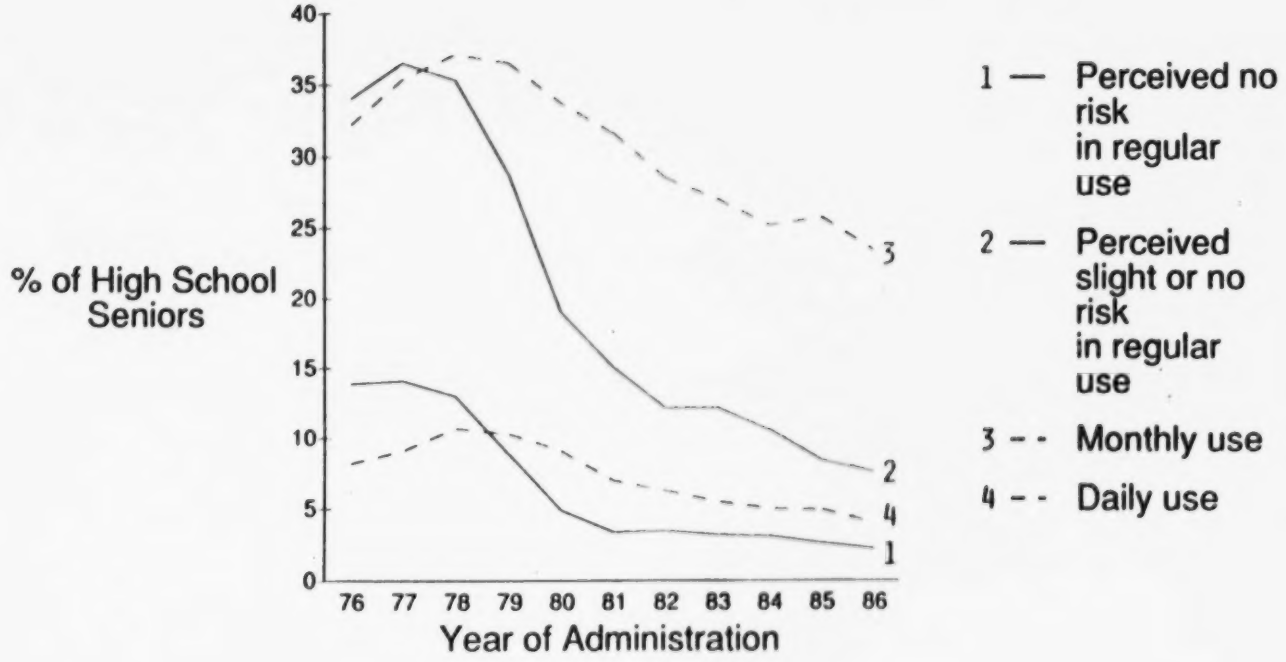

Figure 28

Possible Relationships between Attitudes and Beliefs

(Attitudes affect Behaviors)

(Behaviors affect Attitudes)

("Conservativism" or "Conventionality" affects both Attitudes and Behaviors)

Figure 29

Trends in Annual Marijuana Use Shown Separately for Four Levels of Religious Commitment
High School Seniors, 1976-1986

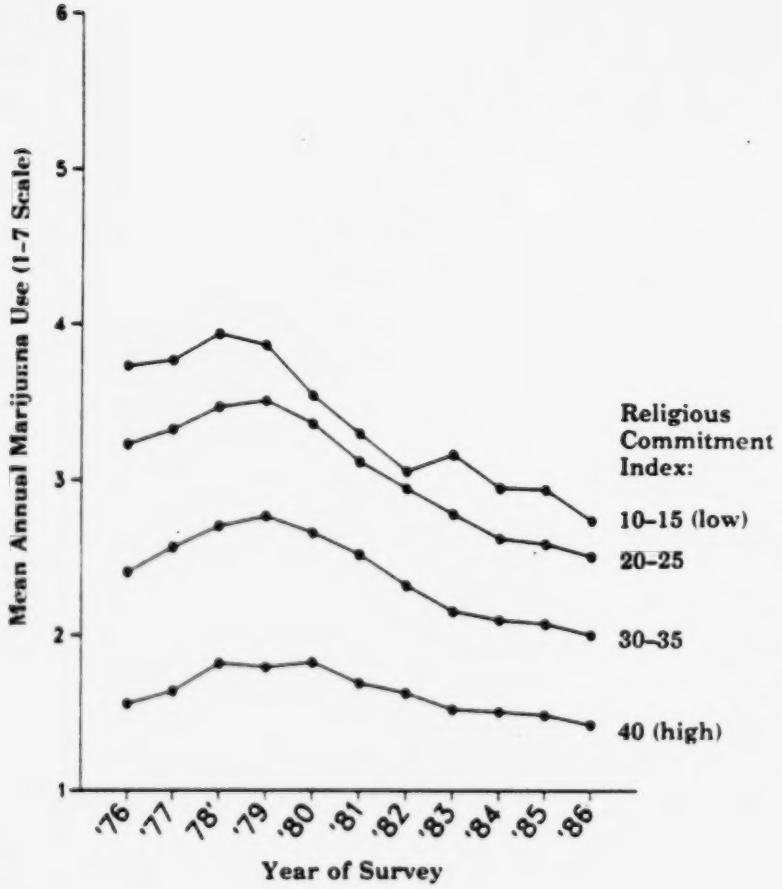

Figure 30

Trends in Annual Marijuana Use Shown Separately for Three Levels of Perceived Risk of Regular Marijuana Use
High School Seniors, 1976-1986